Market Nursery Work Series

VOL. V

ORCHARD FRUIT TREE CULTURE

F. J. FLETCHER, F.R.H.S.

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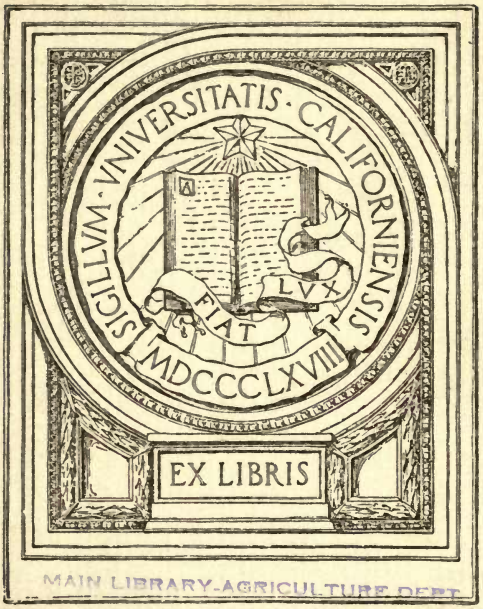

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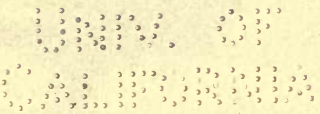

FIG. 1.—Triple Cordon Pear
Pitmaston's Duchesse

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A SERIES OF SIX BOOKS
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VOLUME V

ORCHARD FRUIT TREE CULTURE

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MARKET NURSERY WORK

VOL. V

ORCHARD FRUIT TREE CULTURE

CHAPTER I

INTRODUCTION

To set about writing a book on fruit trees, however modest and limited its scope, is, in these times, a task not lightly to be undertaken. Fruit growing, as we understand it to-day, is a new industry, even though its genesis goes right back to Adam. Our position is somewhat anomalous, for long experience is, in some respects, a handicap. This is the day of the young men, who, having been born into the newer conditions, have nothing to unlearn.

Prior to the last two decades of the nineteenth century, fruit growing, as an organized industry, did not exist—it was a mere side line. In a few favourable localities the genius of the inhabitants had taken it up and partly developed it, but there were only a few pioneers who foresaw its possibilities, and fewer still were the voices crying out of the wilderness, mostly to ears that were deaf. What our climate, aided by the skill of man, was capable of was exemplified by the excellent fruit being grown in large private gardens by trained and skilful gardeners, and though no one would claim that this was produced on anything approximating a commercial basis, yet the fact that it *was* produced in abundance and of the highest quality was perhaps the chief factor in directing to it the closer attention of those most interested.

At that time fruit growing was an art; to-day it is a science, upon which a vast, important and rapidly expanding Industry is being built. Since science took hold of it, rattled its dry bones and breathed vitality and intelligence into it, the whole aspect has changed—completely metamorphosed, and we are justified in our

remark that it is "a new industry." It is, of course, true that orchards existed long prior to the period mentioned, that some few of more than ordinary perspicacity had planted orchards and grown marketable fruit, but these were essentially individual undertakings, not national; the treatment of the trees often being on empiric lines and the marketing methods crude. For every orchard of fruits suitable for the market and table there were several planted for the making of cider and perry; planted, too, in any odd plot, and more especially where it was not conveniently situated for ploughing. Soil, aspect, elevation were not regarded, and it was quite a common thing to see fruit trees planted in low sheltered spots, so that the fruit might escape the force of the wind! Even paddocks, close to the homestead, into which horses, pigs and poultry were turned, were planted with quite unsaleable varieties, the farmer being fully content if, from the top crop, he could make sufficient cider for his harvesters, at a time when the custom of so regaling them was a much more recognized institution than now.

Out of these crude beginnings has sprung, and is still springing, a well-organized scientific industry of vast national importance, which, apart from its economic value, is beautifying our country, providing a healthy and fascinating outlet for the energies of the growers, offering employment to thousands of skilled labourers and supplying increasing quantities of wholesome fruit, now acknowledged as a prime necessity in the nation's dietary.

Notwithstanding the great progress already made, this industry is still in its infancy; it belongs to the future. At the moment it is facing all the difficulties incidental to youth, and is facing them boldly. In many respects it is in the experimental stage—research, trying, testing are in the air, yet such are the prospects that there is scarcely a man in the whole community but owns to a most robust faith as to its future.

If nothing else afforded sufficient ground for confidence, as distinct from optimism, it can be found in the fact that the supplies from the home producer are so far below the demands that in 1920 no less than £8,000,000 worth of apples alone were imported, and though this huge total may have been somewhat due to the shortage in our crops, it was only £2,000,000 in excess of the total for 1919. This assuredly affords a very substantial ground for

confidence; we are not pursuing a chimera, but a commercially sound proposition.

It is open to us to believe that our Industry is now passing through its most critical stage, and that soon some of the most difficult of its problems will be solved. The scientific breeding and selection of stocks; the raising and introduction of yet further improved varieties of our standard fruits; the successful, because unceasing, attacks by Science upon sundry diseases are already showing good results and will tend to the alleviation of our difficulties more and more. And, perhaps, we shall find that the careful raising of young, vigorous stock, under well-considered conditions, will not be among the least of those factors telling for progress; and if an undue proportion of the following pages are devoted to this subject it is because it is the department on which our long experience may be most profitably utilized. It is also a phase, a very important phase, of the subject, less generally dealt with at the numerous conferences that are held from time to time, as though it was more fittingly conserved for the use and practice of the nursery, rather than as a subject for elucidation and discussion round the conference table. Not that we have any reason for supposing that it is so of set purpose, but it happens that the other end of the business is one which, very naturally, is the more attractive and appeals to a far greater number of people.

Let us admit that the raising and growing of young trees is a matter more for the schoolroom and the student rather than for the man who is interested in market growing, that does not detract from its value and place in the complete scheme, and it would perhaps be an all-round gain to the profession if every fruit-grower knew all that it is possible to know about his trees, from the time they were planted as stocks, on through their budding, their maidenhood, their making, up till the time when they had reached their highest perfections and were heavily laden with golden fruit.

Is it unreasonable to suggest that this closer and more intimate knowledge of the life history of his trees, this more complete experience, might prove of great practical value in their after cultivation, and that its possessor would, other things being equal, be the more enlightened grower? And is there any reason why a fruit-grower, with his eye to extension, should be dependent upon others

for his supply of young trees when he has it in his power to raise them himself, in his own way, on his chosen stocks, in his own chosen varieties, and to his own chosen form ?

It has been said with truth that trees are individuals, and possess individual characteristics which it is well to study and know ; we have long proved the truth of this and should like to see its recognition far more general. The keenest growers soon realize it and are influenced by it—and as a result, they are the most successful. This is but another argument why growers should know their trees from birth, and we need not further seek for an apology for dealing with the raising and making of trees in so much detail. We have used but little technical language, and it has been our aim throughout to so write that " he who runs may read."

CHAPTER II

SCIENTIFIC RESEARCH AND INVESTIGATION

In the very commencement of our task we wish to make it perfectly clear that we are not in a position to dogmatize. The day for that has entirely passed away, never to return until the years go back upon themselves, for Science, with all that wondrous word implies, is in full cry, hot-foot upon all that pertains to the growing of fruit.

So full of results is Scientific Research that the last word of to-day becomes the first word of the morrow, a jumping-off ground for further discoveries, which, in its turn, is left behind, as a stepping-stone is left in the bed of the stream. This, though pregnant with great promise for the future, is not without certain inconveniences to us, for it makes it impossible, in a work like the present, to take up problems and handle them with certitude, or with any pretence to finality. Strange to say, we cannot write with the same conviction we could have written with twenty years ago, for this great new force has finally upset all our old theories and practices, turning its searchlights into dark places, revealing hidden mysteries, destroying completely our old complacencies what time it evolves and establishes its own sure and reliable system based on the impregnable rock of Truth and Knowledge. Data is being collected and examined, details scrutinized, facts proved, and all we can do is to keep an open mind, follow closely on the heels of Science, noting and rejoicing in its progress and availing ourselves of its wonderful discoveries.

In this connection we would most earnestly urge upon all whom it may concern to follow closely the columns of such a journal as *The Fruitgrower*, which with a praiseworthy and intelligent enterprise records week by week for our benefit all that is latest and best in scientific research so far as it is of practical use in our industry.

Along certain main avenues the progress is remarkably rapid. The investigations of diseases, their causes, prevention and cure, are being pressed forward in accordance with the best traditions of never-satisfied science. The erstwhile mysterious and destructive

Silver-leaf which was actually working toward the extinction of the most valuable of all plums, the "Victoria," has been definitely traced to the fungus *Stereum purpureum*, and thus far brings it within control that its menace no longer alarms us. The sources of other diseases have been similarly traced, and this, of itself, is to be put in possession of a weapon wherewith to combat them and stamp them out. "Big bud" in black currants, "American mildew" in gooseberries may be noted in this category, and the panicky and wasteful method of dealing with them is giving place to methods altogether saner and less iconoclastic.

"Plant breeding" is the objective of other research, and the selection and standardization of fruit tree stocks is another—one which has unearthed much valuable data. It would be exceedingly difficult to overestimate the importance of either of these, but perhaps the latter makes the most direct appeal to the imagination and opens up a most promising field for further research.

A definite but quite limited knowledge as to the respective merits of certain fruit tree stocks was established, on a broad foundation, more than a generation ago, but research, systematic because scientific, has in a few short years revealed to us how really little we knew. Instead of the mere broad distinction as between "free" and "dwarfing" stocks, we know now that in both sections considerable and numerous varietal distinctions exist, and these, being scheduled and standardized, our future fruit-growers may be in the enviable position of selecting stocks according to their special requirements. This is no trivial achievement, but is rather a movement to successful and patient investigation. (See illustrations 2, 3, 4.)

Not less than four decades ago we found our speculations turned in this direction, for, in a row of crabs, consisting of a dozen trees, we noticed there were five distinct varieties of fruit, with corresponding differences in habit of growth and colour of bloom. The thought occurred to us to keep the varieties separate or to save the fruit only of the best for seed; but we were juniors then—very much junior—and were not credited with perspicacity or much other thought, so our suggestion fell upon deaf ears. It is, however, none the less gratifying to learn that others have acted along the same lines, and that at long last the idea has proved itself to have

been correct. The significance of the results in this direction, obtained at the East Malling Research Station, is great indeed, for in the golden days of the future that disparity in the growth and cropping powers of trees of the same variety, growing side by side, hitherto inexplicable, but now satisfactorily accounted for, will then be a thing of the past.

FIG. 2.—Types of Stocks (Crab)

Equally gratifying advance is being made by those who are engaged in the campaign against insect pests. The life history of each is being laboriously pursued as the only means whereby its ultimate destruction can be effected. The losses caused through the depredations of insects are incalculable. For generations we have been fighting our enemies with results not very satisfactory to ourselves, because we were fighting in the dark. We did not

understand them, their life's history, their habits, nor their methods of attack, as we should; consequently most of our efforts have been somewhat empiric, slow, cumbrous, experimental, and only half successful. Even to-day we are still defied by some of the most persistent and virulent among them, and, frankly—as yet—science

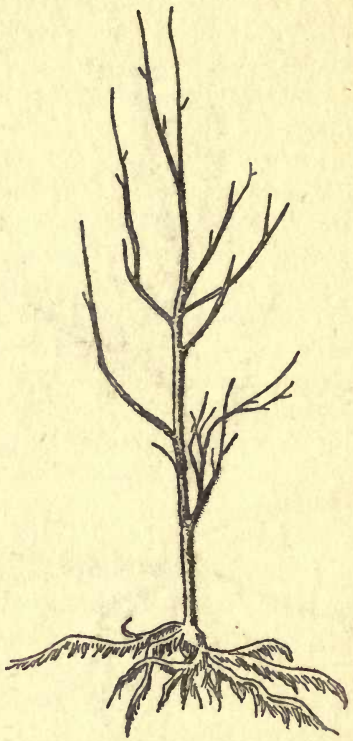

FIG. 3.—Paradise Stock

is found wanting. This, however, is merely a matter of time and illustrates our remarks at the opening of this chapter to the effect that we cannot yet deal with problems with certitude or any degree of finality.

We were tremendously impressed by a statement recently made by an eminent authority, and we refer to it in order to impress our readers, that the female "blue bug" of our apple trees produces

FIG. 4.—Quince Stock

a *thousand thousand* millions of young a year. That is doubtless an intelligent and vouched for estimate which we can very well accept, and it is a statement of the concrete order, which fastens at once upon our imagination and impresses us as no less bald statement could. It gives us a fair idea of the vast importance there is in the studying of this problem, for the " blue bug " is not the only, nor is it the worst of our enemies. It is quite safe to say that in the adequate destruction of insect pests lies very largely the future prospects of our industry.

Neither must we overlook the fact that some of our most potential enemies lie hidden in the ground. Not only have we such well-known enemies as wire-worm, centipedes, and all their relatives and friends, but science has recently taken up the soil and discovered to us incredible bacteriological facts. It has shown us that in a spadeful of earth there are millions of friendly and unfriendly bacteria, and it has shown us how to encourage the one and discourage the other, and that, as we till the soil, so exactly will the results be beneficial or inimical, and that effect will follow cause as relentlessly as fate.

It seemed good to us, before attempting the more detailed study of the raising of fruit trees and the growing of fruit for market, to make this brief reference to the advance of science, and its incalculable aid to our efforts. Our minds, seeking enlightenment in its beneficent rays, will approach the lesser, but equally important, details of cultivation in a clearer atmosphere, and a mentality which will effectually range far beyond the severe and limited outlook, which for so many generations retarded the development of the growing of British fruit.

CHAPTER III

PLANTING STOCKS

A TREE'S future depends as largely upon its beginnings as a man's future upon the days of his childhood. If those beginnings are sound and healthy the trend is toward health and vigour, if bad, they carry the handicap, almost invariably, throughout life. This is no mere figure of speech, but solid, rock-bottom fact. Bud an unhealthy stock with a healthy bud; or bud a healthy stock with an unhealthy bud; or graft a good scion on to an unhealthy stock and carefully note results; you will not then think we speak in exaggerated terms when we urge the importance of a good start.

The building up of a healthy, well-formed and productive tree is a very fascinating occupation, exercising the highest faculties of a man, viz. his creative powers; and it is satisfying, in that he knows he is producing a something that will "live after him," a living monument to his manes, thriving and producing when he himself has departed hence.

A perfect tree begins with a good stock. Stocks should be carefully selected, carefully trimmed, carefully planted in carefully prepared ground; this quadrupled care being the assurance of a good start so far as that can be controlled by man.

WHEN TO PLANT

The planting of stocks should by preference be done in October and November, and certainly finished by the end of the year. Circumstances may, and do, arbitrarily interfere with those dates, but every effort should be made to get round them. Planting should not be deferred till spring. We insist upon this with good reason. We believe everything should be done to promote a good forward condition for the stock at the beginning of the season, for almost invariably that very critical period, from the beginning of May till mid-June, is subjected to drought or to drying cold east wind, which at once imposes a check most effective on backward and puny growths. Late-planted fruit stocks particularly suffer

and they have scarcely recovered thoroughly by budding time, whereas the autumn-planted stocks have been strong enough to defy any ordinary check. Experienced budders will confirm what we say on this point. The cause for this is very apparent, for if a stock is planted in November and taken up for inspection a month later it will be found to have made many new roots and is thus "established"; while a stock planted in January is found to be in the same condition in March as when it was planted. The conditions, then, are all in favour of the former.

How to Plant

The preparation of the ground is well worth careful consideration. If it happens to be foul with spear grass, or other perennial weed, it must be thoroughly cleaned, for, as the stocks will occupy it for three or four years, no favourable opportunity occurs later. We have seen whole quarters of young fruit trees in a sorry plight because sufficient attention was not given to this at the right time. Obviously the right time is when the plot is free from a crop.

Clean the ground, then, as a first condition. Manure, but not heavily. If that applied for the preceding crop is not spent, no more need be given, for the stock itself needs but little, and it is always possible in the autumn or spring to dig in more between the rows when it is wanted. We are ourselves inclined to place a higher value, at this stage, upon cultivation than upon manuring, and by cultivation we refer to the satisfactory mechanical condition of the soil when worked. The tilth should be not less than full spade deep, that is, with the spade driven in horizontally and not slanting. We would as a matter of preference recommend double digging where the subsoil is amenable, but do not insist upon that. Those who resort to this deep working know that the advantages are solid and undoubted.

Should the soil be heavy it must not be worked when wet, for we have seen very sorry results on quarters where planting has meant the turning over of a solid block of wet heavy earth on to the roots of the stock. Almost as well might it have been solid rock!

The development of the actual root-system of the stock, upon which so much of its future depends, is itself very dependent

upon the cultivation it receives in these initial stages, and we feel that it is our duty to emphasize this here and now. Fruit stocks are not like young forest trees, with coarse thong-like roots calculated to bore their way through clay boulders and such-like impedimenta ; we would not let them develop such roots if they could—but their root-system is, or ought to be, a mass, or network, of slender fibres, not thicker than a knitting needle—so fine that they turn away from solid earth and worm their way about in open, warm, and congenial soils. It is these fine roots we do our best to encourage, for it is these which produce the fruit buds. They come to the surface, or very near it, to feed, imparting tone and solidity to the growth, and render vast economic services to the future tree. We insist, that to develop this to its utmost, the fruit-stock bed should be as carefully prepared as a flower bed, for when this is done such a splendid root-system is built up that it can face and resist more than a " peck " of future troubles.

There is often a tendency on the part of some stocks, more particularly the " free " pear-stock, to develop two, three, or even more, strong anchorage roots. Where it is so, they should be shortened back at planting time ; and, indeed, this may also be done to advantage with the finer roots where they happen to be long. But let the cutting be done clean, with a sharp knife, and not too drastic—half the length being taken as an approximate guide.

Do not plant deeply. If the crown of the root-system—that is, where the stem develops into root—be 2 or at most 3 inches below ground, that should suffice for anchorage and for the withstanding of drought. So, in cutting out the trench in which to plant, the cut should be 6 inches deep. Fruit is not budded so close to the root as roses are, but all the same, the less of a leg there is the better. There are, of course, exceptions, where the buds (mostly of stone fruit) are put in standard high, but our remark about the shortness of leg holds good as a general rule. Another reason against deep planting is, that we want the roots to be, in the main, surface roots, and there can be very little point in putting them deep down to make them come up again.

The distance apart at which to plant varies somewhat with the character of the stock and the form of tree it is desired to produce. Let us take the apple as a typical stock. If we plant paradise

stocks and intend to grow a quarter of cordons, we plant them about 10 inches apart in the rows and 15 inches from row to row. If on the same stocks we wish to grow up to three-year pyramids, then we plant at 1 foot apart and 18 inches between the rows. If we plant "free" or "crab" stocks for producing standards, we plant at 15 inches apart and 22 inches to 24 inches from row to row. We cannot afford to be too prodigal of space in nurseries, but we have always found these spaces to be convenient and workable. Overcrowding is to be avoided, and the trees at two and three years after working should always be visualized when planting the stocks.

CHAPTER IV

BUDDING

THE budding of young fruit stocks is a very simple operation and can be easily learnt in a very few minutes by those who are so minded. It is, however, an operation requiring great care, and along arbitrary lines, for there are not several ways of doing it. To all intents and purposes it is a surgical operation, and calls for even fastidious care.

But because a thing calls for care and precision it does not necessarily follow, on that account, that it is intricate or difficult, providing simple rules are observed. Failure will undoubtedly follow slipshod or haphazard methods, and these are entirely reprehensible, because when buds do not "take" it is not the value of the stock or the bud which counts, but the loss of a year, which is a far greater and more irreplaceable thing. This should be borne in mind, especially by young budders; and we write this because when we were but fourteen years old we had already budded several thousands of stocks, and had considerable experience of the mechanical part of the operation long before we had anyone sufficiently interested to impart to us the ethical. So, as there are doubtless as many youthful budders as ever there were, we have ventured these few words for their benefit.

Much depends upon the condition of the stocks as to when they should be budded. If they were planted in accordance with our remarks in the preceding chapter, and were kept clean during the spring and summer, they should be in full sap and ready for budding during the first half of August. To the general nurseryman this is a most convenient time, as he pushes on with the rose budding throughout July and is then able to go straight on with his fruit. Any earlier date is not so suitable for budding in quantity, as the buds would scarcely be ready; and the driving it off till a later date exposes us to the danger of seeing a sudden stoppage of the sap if dry, hot weather sets in. It is essential to successful budding that the bark of the stock should run very freely, otherwise the cut cannot be forced open without more or less bruising the bark or

injuring the " cambium," and this bruising must seriously compromise the success of the operation.

The buds are taken from wood of the current season's growth, and these, too, must be " in sap." It must be fairly firm wood, and the eyes from the lower part of the growth must be used in preference to the soft, immature, and still growing top. They should be taken from young trees rather than from old, as containing greater strength, vigour, and vitality.

Let us here add that the whole of these instructions are general, and apply to all our hardy tree fruit : apples, apricots, cherries, peaches, pears, and plums.

Immediately the buds are severed from the parent trees they must be denuded of their leaves—otherwise they will draw all the sap out of the wood—the leaf-stalks being left on as " guards," as shown in Fig. 5. Then they must be stood upright with their heels in shallow water and kept in the shade, or, better still, be wrapped up in a piece of wet sacking, until they pass into the hands of the budder for immediate insertion.

The method of making the T-cut ; of cutting out the shield-like bud and taking out its wood ; the insertion of the bud itself, are all shown in our illustration 6, and being so shown are less likely to be misunderstood than any words of our own. All we need insist upon is that all should be neatly and deftly done without bungling. The knife used should be as sharp as it can be made, the handle end thin, so that there can be no danger of bruising the membranes and fibres ; and in the making of the T-cut in the bark the pressure on the knife should be such that it does not penetrate or wound deeper than that, for the slightest abrasion on the underlying wood may breed future trouble unless the stock has sufficient vitality to heal it over quickly. Neatness and deftness may soon be acquired by practice, and both these are essential factors in promoting and assuring the success of the operation.

The proper tying of the buds is a detail entrusted to the juniors, but it must be looked upon as being a very important detail. It has definite functions, which if perfunctorily done it cannot perform. It holds the bud in the close embrace of the stock, so that the sap cannot pass it by unfed ; it closes and binds the wound ; it excludes the air, and wards off rain and sunshine and

renders the same serious service as do the surgeon's bandages to an injured limb.

Do budders always realize that they place their reputation in the hands of the youngsters who tie in their buds? Do they always

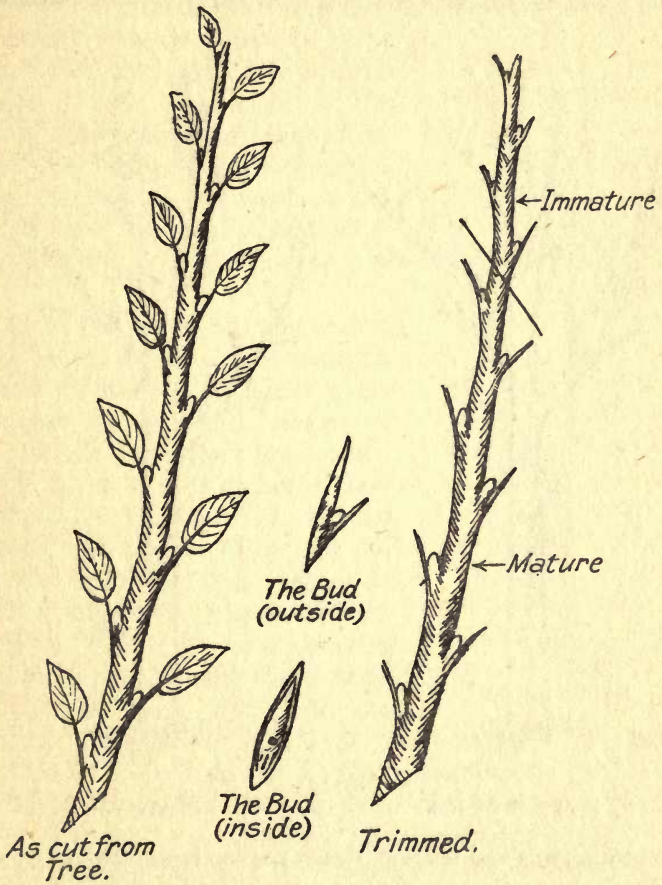

FIG. 5.—Buds

impress upon them the importance of the duties they are performing, and make frequent inspection? Some do; some do not; all should. It does not seem long ago since we had our place among the tyers, and we still have a very vivid recollection of those days

though the calendar has gone round a full half-hundred times since then.

The material used for tying-in purposes varies. At one time we used Archangel mats cut up ; then we got to raffia ; then to twisted cotton ; then to raffia tape and back to raffia again. The desiderata

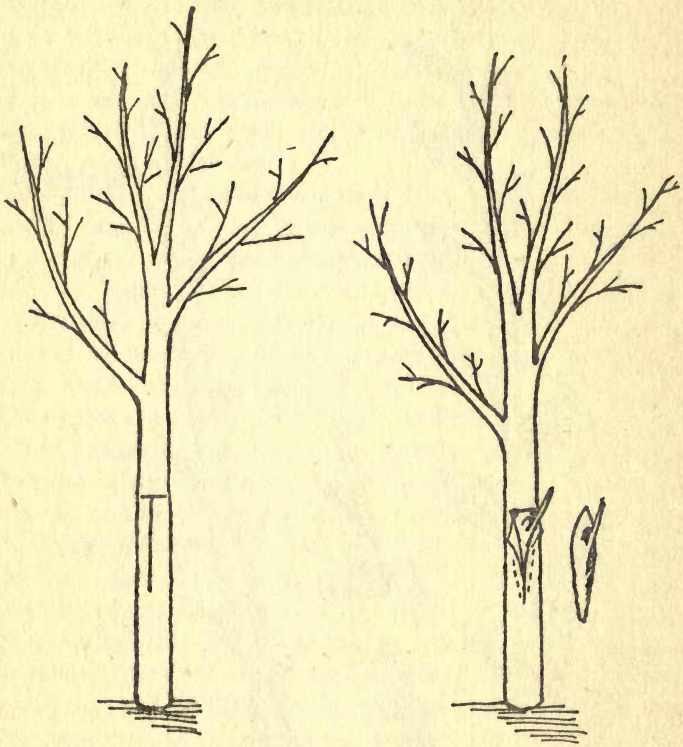

FIG. 6

T-cut ready for Bud Bud insertion

is something soft and holding, that is not too much affected by the weather. As to the actual tying : the ligatures should be close together round the stock, beginning below the cut, working upward, and finishing well above the T-crosscut, every strand being drawn taut. The projecting " guard " is worked up to quite closely, and care is taken that no ligature smothers the " eye " ; otherwise the actual binding is close. Our illustration, Fig. 7, shows the

operation complete. One rapid budder should be followed by two tyers, so that there should be no inducement to them to scamp their work.

After about a month the buds should be examined, and if the weather has been so propitious that the sap is still active in the stock, any buds which have not taken may be replaced with fresh ones inserted a little lower down in the stock. We assume that these will be very few in the ordinary way, for fruit budding is not hazardous, and if the stock, bud, and manipulation be right, the bud is almost sure to live.

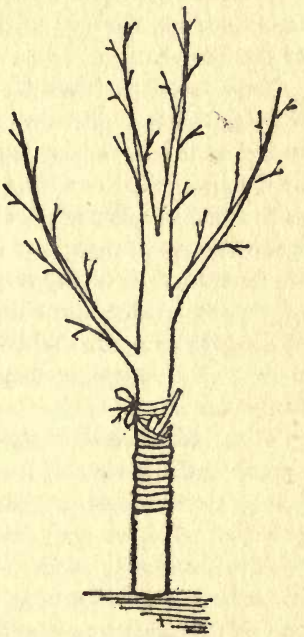

FIG. 7.—Binding

About the middle of September it may be found necessary to somewhat loosen the ligatures, especially where the stock has appreciably swollen, as it naturally would do when healthy. With this in view, the bindings were fastened in a double bow, so that release may be expeditious. By the middle of October it is possible to remove the binding altogether, though it is the custom in some places to let them remain until the weather has rotted them. We prefer the orderly and methodical plan of removing them in October, and utilize the occasion by a close examination as to the well-being of the buds. This completes the year's work, and we shall defer the " after treatment " considerations, in order to deal with grafting, after which the treatment of the one works in with the other.

CHAPTER V

GRAFTING

GRAFTING constitutes a much severer test of the craftsman's skill than budding, though, strictly speaking, the latter is but a variant of the former.

Known and practised by the ancients it has come down to us through the ages, but we venture to think that the centuries have looked upon it as unchanging as the potter's wheel. In all probability its details were at one time hidden in a thick cloud of mysteries—as so many simple performances were—to befog and to impress the ignorant, but grafting has never been anything but grafting, and we think we do it to-day very much as it was done by the craftsmen of ancient Greece, the citizen gardener of Rome, and the monks of the Middle Ages. Whether that be so or not is a matter for the curious, and whatever they may decide has little practical value for us.

There are several methods of grafting, but only two of these appeal to the grower of fruit trees, and only one to the raisers of young stock. One is known as *wedge* grafting, and is usually practised when we graft new heads on to advanced trees, when we wish to change the variety. We may have to refer to this later on ; it need not detain us now. The other method is *tongue* grafting, and this is the most generally adopted, the method indeed we have to do with here.

Taking up the subject-matter where we left off at the end of Chapter IV, we go over the budded quarters of fruit stocks early in March, and behead them to within an inch or two of the bud. Where there have been casualties during the winter and buds have died, the season, otherwise lost, may be saved by resorting to grafting. This is done at the end of the month, and the knifesman, when he cuts back the stocks near to the live buds, cuts down less drastically those in which the buds have missed. Some prefer to leave the stock intact where grafting has to follow, on the ground that the sap is assisted in its rise if the head is left on ; but this is not a material point.

The grafts, or scions, will have been cut from the stock trees some weeks before, in fact, when the trees were pruned, and retarded by being heeled in deeply and thinly on a north border where growth would least be excited. In every scion there is locked up a reserve amount of vitality, and upon this it is very desirable that no demand be made until the time of grafting ; it should be dormant when used. The stock, on the contrary, is not retarded in any way, but is required to be in sap when the scion is grafted on to it, so that it may be immediately available to the stranger it has to nurse. If the stock is actually dormant at the time of grafting it can contribute nothing to the support of the scion, for the time being, and it may so happen that during the time of waiting, the latter, exposed to dry harsh winds, may shrivel and perish. We may take it as necessary for the stock to be well in advance of the scion. If the scion should be in advance of the stock, and used up its own limited reserves before the stock could contribute anything, its failure would be inevitable. So much depends on the condition of the stock, and this we hope we have made clear.

The actual operation of grafting is more difficult, and calls for greater skill and precision, than budding. The essentials are, a good knifesman, a sure hand, a true eye, and an exceedingly keen knife. For the cutting must be bold and clean and true, not sniggering or uneven.

In using the knife the movement must not be in one direction, straight up or down, using one section of the blade only, but it should have a double movement, beginning the cut from the lower half of the blade and finishing at the point, whether the direction be upward or downward. A straight up or down pressure, with no slide, is apt to roughen the pith, and a rough surface anywhere is not conducive to rapid healing and a firm, perfect union.

We referred to budding as " a surgical operation " ; how much more so is grafting, or the fitting together an unrelated scion and stock with such precision that they speedily become incorporated as one ! There are so many points at which something might go wrong : either the union may be imperfect and generate a weakness ; an inexact fitting together of scion and stock ; a misplacement by accident ; and the only means of guarding against these is by the most skilful manipulation on the part of the operator.

Our illustrations show clearly the *modus operandi* of grafting. In Fig. 8A the stock is shown, headed back to within a few inches, and Fig. 8B shows the same stock cut ready to receive the scion. The white space up the centre is the pith ; the next slightly shaded portion is the wood, and the outer, heavily shaded portion is the bark. Between the bark and the wood lies a system of tissues, the sap carriers, without which not a single slender twig or the mightiest tree trunk could exist. These tissues play the most important part

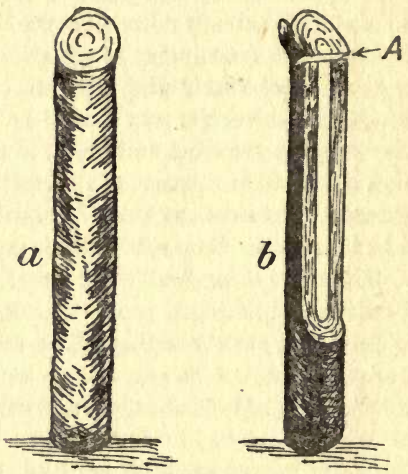

FIG. 8.—Binding. Whole covered in with grafting wax

in grafting ; it is through them that the union is effected, for the scion has a " cambium " (the technical term) as truly as hath the stock. The corresponding system of both being brought into juxtaposition and secured, that of the stock being the more dominant, is the vital principle of the operation.

In Fig. 9A we see the scion as cut from the tree ; and in Fig. 9B as cut ready for fitting on to the stock. Looking closely at this figure you will see a tongue, formed at the upper portion of the cut, and on Fig. 8B you will see a notch cut at the corresponding position, into which this tongue is fitted, the tongue and notch being aids to

fixing and holding the scion in its place. The exact position of these does not greatly matter so long as they correspond, but they should be not too far removed from the top.

In a great majority of cases, the stock is larger than the scion. The ideal would be to have them of equal size, but the ideal is often the unobtainable. When there is such disparity in size, how is it possible to get the perfect fit we have advocated ? It is obviously impossible, so we have to half the chances and see that there shall be an exact fit at least on one side. In Fig. 10 the scion is about

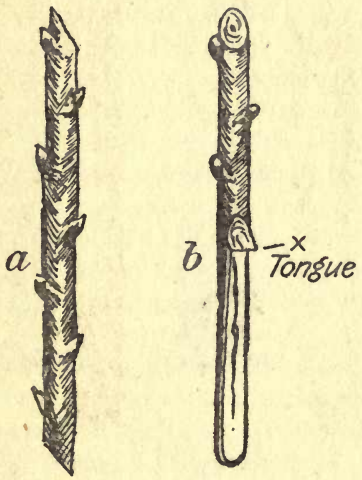

FIG. 9

The Scion Scion ready for Stock

half the thickness of the stock ; bark meets bark down one side, the other side is void, and it is only the flux of time and an abundant sap which can fill that up.

The foregoing are the principal operations in grafting, but more remains to be done. The binding is as important, probably more important, than we showed it to be in " budding," and it certainly must be as thoroughly and scrupulously done. There is a greater need for constant pressure ; the mutilation is greater, the exposure more, and these have to be obviated by a more generous binding. A long stout strand of raffia best answers the purpose, and if one

is not long enough, use two. Even a bird alighting on the scion would probably displace it if the binding was deficient or loose. Every turn of the raffia round the stock should fit in compact and

FIG. 10
Scion *in situ* on Stock

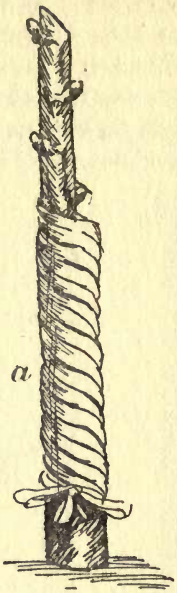

FIG. 11
Stock headed back — Stock ready for Scion

close to the one above it and make a covering practically impervious to the weather, after which, in order to make assurance doubly sure, the whole is covered with a layer of grafting wax. (See Figs. 11A and B.)

CHAPTER VI

MAIDEN TREES

TOWARD the end of April both the buds of the preceding August and the grafts of March will be growing unless the season proves to be unusually backward, and from the time of their start, right on throughout the growing season, they will be maiden trees in the making. Those whose knowledge of young trees and care for them is enlightened, and something more than superficial, will know that though a tree may live a hundred years the most important year of its existence is its first year. It would not be easy to exaggerate all that its first growing season means for the future tree, for during that short period of four or five months its constitution is formed and its character largely determined, these being influenced for good or ill by the conditions in which it finds itself. If the ground was prepared and the stocks planted as suggested in Chapter III, then those conditions are likely to be of the best, and everything else depends upon the treatment, intelligent or otherwise. Ordinary field treatment of the "rough and ready" kind may very well demonstrate the doctrine of "the survival of the fittest," but careful cultivators will concern themselves in making them *all* fit, and this is a far wiser economy. The infant trees are literally "in the nursery" and need careful nursing, and are not to be abandoned to that savage natural law. To the nurseryman they are all of equal value, and his interests are bound up in his efforts to keep that value as high as possible.

Are we quite clear as to that? It is useless to pass on till we are. We repeat: those young nurslings, just starting on their career, must have every attention and every assistance in building up a healthy constitution, so that by the end of the season they may become fully developed maidens out of which satisfactory trees may be made. The experienced cultivator quite appreciates this and makes it his special care to see that the conditions are distinctly good so far as it lies in his power to make them so. In February, while all is dormant, he begins his work by "pointing over" the soil between the stocks, that is, practically digging it lightly to destroy and bury

the winter annual weeds and further to aerate and cultivate it. This done, he heads back the stocks, and when active growth begins will be ever ready to rub off all suckers, that is, the growths belonging to the stock, which naturally having first claim would, if left, rob the new bud or the scion of nourishment and strength.

The healthier a stock may be, the more persistently does it throw up suckers in its determination to remain " itself." This we can very well understand, and we have to impose our will upon the stock by depriving it of other means of development than those we have provided for it. So the struggle must go on throughout the season and every unwanted wild growth be ruthlessly removed.

We are now, where we commenced this chapter, at the end of April or the beginning of May. The buds and the grafts have started, and the first care should be to provide each tree with the support of a stout, straight stake, to which the young growth can be secured. At this early stage the union between bud and stock or graft and stock is not strong, it can only consolidate with growth, so that any head pressure from the wind is apt to prize the union apart—and this can never be replaced. The stake should be on that side of the stock opposite to the scion. Where you are dealing with a grafted stock one tie should pass round the stake and the lower part of the scion, and another round the upper part, for thus only can security be given. In the case of a bud the first tie should embrace the bud and that portion of stock left above the bud (not more than 2 inches) and the stake ; the growth trained straight up the stake should be secured at every 6 inch or 8 inch interval.

As regards the growths themselves, these are practically permitted to grow as they please, without let or hindrance, stopping or trimming, for in this way they are best able to provide themselves with a good constitution. In reality, the growing season is so short that they have not time to become formidable or to develop much strength apart from the main growth, this being clearly shown in our illustrations, Figs. 12–15, which are drawn from life. In these figures may be noticed the different habits of growth characteristic of the stocks used ; for example, the maiden apple on the paradise stock (Fig. 12) is far less vigorous than the one on the crab stock (Fig. 15), though in all other respects the trees are equally healthy, promising, and satisfactory. The pear shown (Fig. 13)

FIG. 12

Maiden Apple on Paradise Stock

FIG. 13

Maiden Pear on Quince

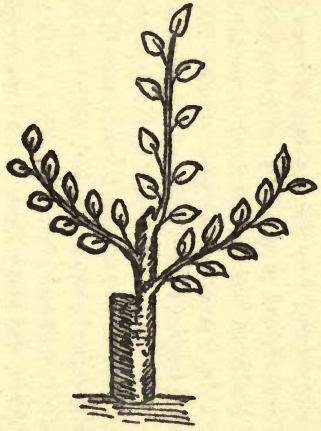

FIG. 14

Grafted Apple on Paradise Stock

FIG. 15

Maiden Apple on Crab

is worked on the quince stock, but a corresponding maiden on the pear-free stock would show the same difference in size to the other as the apples on the paradise and crab respectively.

The maiden grafted apple tree (Fig. 14) has quite a different character, just as " scions " differ from " buds." The latter develop from one eye or bud only, though there is a possibility of two other subsidiary buds breaking out from the base ; but grafts can send up a leader from every bud on the scion, three, four, or five. The character of growth is therefore entirely different, and thus they lend themselves naturally to the making of trees of a more spreading habit such as trained or pyramids, while the bud as naturally develops a single leader to become standard or cordon. This is not a hard and fast rule, but rather the general one. But perhaps the greater danger that imperils the welfare of a maiden tree and, consequently, the whole of its future, is found in the depredations of insect pests, and it calls for all the watchful resource of the grower to fend them off. They come in such incredible numbers, and so suddenly, as to border on the miraculous. The blue aphis and the woolly aphis on the apple, the black aphis on the cherry, the " blight " on the plum, the red spider on peaches, and so on, are formidable and deadly foes, and the very least of the evils they inflict is that they prey on the foliage and prevent the leaves from functioning. The greatest novice knows that unless the leaves function there can be no growth, and consequently no healthy development.

It is possible to prevent these pests by timely and frequent sprayings, and even at the cost of some labour it is a better economical proposition to prevent their settling on the young trees than to exterminate them after they have settled. But unfortunately this is more conspicuous in its breach than in its observance, more by lack of opportunity than lack of will. These pests come ; whose trees are they to be, ours or theirs ? That is the issue to be fought out, and that without any delay. It is little use to wait until the mischief is done, so the wakeful grower makes ready and fights. The maiden trees are of a size that every leaf is within reach and easy to handle. The most drastic, effective, and cheap method of procedure is to mix pails of a well-proved insecticide, remove the ties of the trees, immerse all the affected parts in the insecticide and wash off every enemy by the aid of a soft brush ; then retie

the tree into position. Intelligent juniors, under supervision, can very well be entrusted with this work and can pass over a large quantity of trees in a week.

Immersion is far more thorough than spraying, because no matter how carefully the spraying may be done, curled and crinkled leaves provide retreats where the spray cannot properly penetrate, and to leave just a few such places with their pernicious occupants is but to scotch the trouble and not to kill it. Even frequent sprayings are not so effective as immersing and washing, and to argue that it is quicker does not meet the necessities of the case. Spraying does of necessity apply to larger and older trees where immersion and washing are impracticable, but for these maiden trees, every portion of which can easily be immersed, there is nothing like the simpler and more thorough method here advocated.

Having done all that is possible for clean and healthy vegetation, it is a simple matter to see that equally careful thought should be given to the welfare of the roots. There is but one tool used for this purpose, and that is the hoe, in some one of its varied forms. Especially in a time of drought, when the lack of moisture arrests growth, the timely hoeing between the trees will effectually counteract it, so that the progress is maintained. But apart from that, it is quite surprising what a beneficial effect a good hoeing has upon the roots, which is soon reflected in the top by the leaves putting on a deeper and more leathery green and the glistening of the bark. Strange to say, some people have difficulty in crediting the hoe with so much, but experienced hands know that hoeing frequently is one of the important and indispensable conditions in cultivating young fruit trees. Let it not be neglected.

In September, the trees have put on an inferior second growth, which is no use to them permanently and is pruned off before spring. All activity then ceases outwardly, though within the tree the sap is slowly going back. The leaves ripen and fall, and our maiden trees are before us, made—or marred. In the spring it will be our business to ascertain what form each individual tree has determined for itself; to modify it according to our own requirements, and to assist the tree in making itself, by the judicious use of the knife. But then, they are no longer maidens.

CHAPTER VII

THE MAKING OF TREES

For the cultivator, the actual making of trees begins with the end of their maiden year. They have of their own volition more or less declared their natural tendencies as to form, and if these agree with the wants and wishes of the grower, his work is to encourage them and to see if he can help them in their development. If, on the other hand, his designs do not agree with what the trees are doing of themselves, a judicious and wise use of the pruning knife will turn their energies toward the desired end.

Our illustrations of maiden trees (Figs. 12–15) show that each of those figured has a distinct bias of which advantage may be taken, or to which a different direction can be given. In Fig. 12, a maiden apple, budded, on paradise stock, declares itself quite unmistakably as preferring the pyramid form ; 13, a maiden pear on the quince, is perhaps more emphatically inclined to become a cordon; 14 is a grafted tree, an apple on paradise, and, as is most usual with grafts, wants to become an espalier ; while 15, a budded apple on the crab, runs aloft to become a standard. These particular specimens were selected to illustrate the respective bias of each, and also because it would be such a simple matter to give either of them a form different to their chosen one : 12 could become a half-standard ; 13 a pyramid ; 14 a bush ; 15 a half-standard or pyramid. A large percentage of maidens give no indication as to their natural trend, and the grower has to use considerable judgment as to his treatment, for he wants, at the same time, to make them really good trees, and to have them of a desired character. It is only so far as their adaptability fits in with his requirements that he can rely upon it. What he has to visualize as he deals with the individual tree is what that tree will be in three years' time, and this is not difficult to the man who understands trees and who knows their behaviour under treatment.

Our next illustrations (Figs. 16–19) show the same trees after another season's growth ; also, for the sake of convenience, in faint outline, that of the third season, excepting the standard, and this

latter is shown alone in Fig. 20, as a third year tree which must be compared with its two year form in Fig. 19. These illustrations will show the novice that trees are made by means of pruning, but we want him to understand that pruning is work for skilled, not unskilled, hands. There are two classes of men who, with their pruning knives in hand, we cannot look at without a feeling of

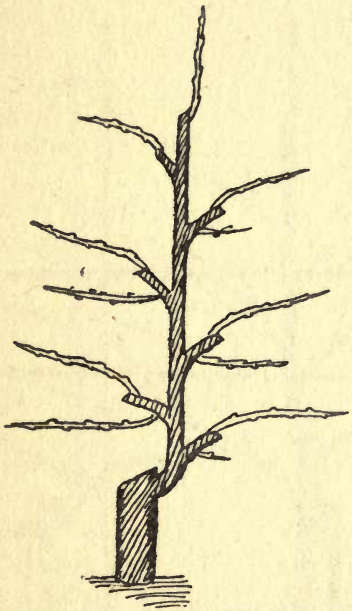

FIG. 16.—Two-year Pyramid on Paradise Stock

Shaded portions, Old Wood
Light portions, New Growth after Pruning

FIG. 17

Two-year Cordon Pear

apprehension and alarm ; one is the novice who sees no danger and slashes away accordingly—the other, the man who with the wisdom of the owl upon his face potters about a tree, snipping off every shoot which he fancies interferes with its symmetry, and cuts back the various stronger growths to where he thinks it will look best. He gives no thought to the future because he lacks knowledge ; and the present appearance of the tree is all that matters to him.

We would lay considerable stress on the fact that pruning requires intelligence of a very high order ; there must be considered reason behind every cut made, for a serious error can easily be made which would be exceedingly difficult to undo at any future date. A friend of the writer's went into a new house and garden in the autumn of '21, and immediately made a havoc among the trees

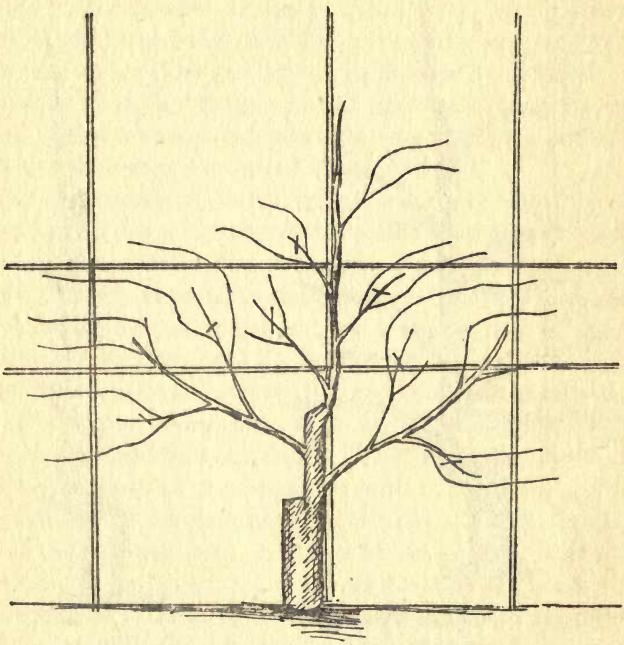

FIG. 18.—Two-year Trained Apple on Paradise Stock

" because he understood it was the right thing to cut them every year."

We believe in early pruning, not less for younger than for older trees. The autumn is better than the spring for this important work. This may, or may not, be a debatable point—we scarcely think it is—for the determining time factor is the sap of the tree. In young trees, this " goes back " (whatever this may mean) more tardily than in older trees and becomes active earlier in the spring, and we consider that the sooner it can be attended to after the fall

of the leaf the better it is. There can then be no possibility of loss of sap through bleeding, and this is the chief consideration, for loss of sap is loss of vitality. When pruning immediately precedes the flow of the sap, so that the wound has no time to cicatrize and heal, it bleeds, and how much it loses may be estimated by those who

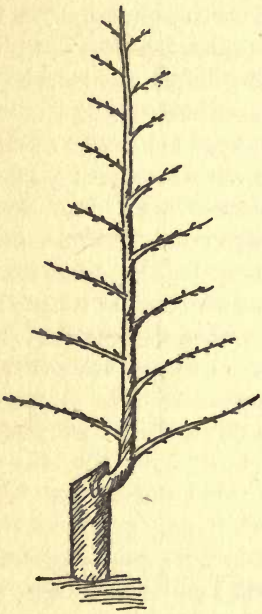

FIG. 19
Two-year Feathered Standard on Crab

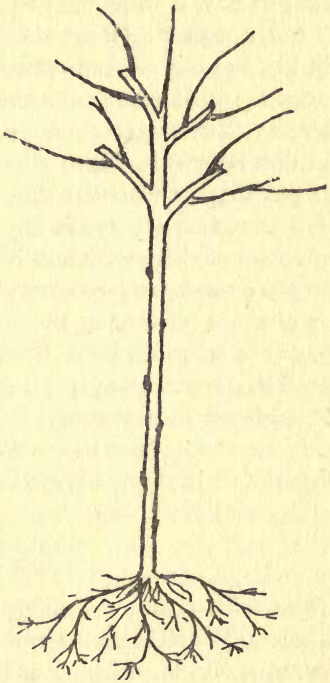

FIG. 20.—Three-year Standard Apple

will inspect a healthy spring-pruned tree. We can quite understand a case where late pruning is resorted to for the express purpose of checking redundant growth, but it cannot wisely be applied to a tree just setting out upon its career, which needs to conserve every energy for its own use in building itself into a strong tree. We plump for autumn pruning; more—for young trees of two and three years, and still in the making, we insist upon it.

The pruning of young stock differs in motive from that of fruiting trees. The latter are pruned to increase fertility by the production of fruit-bearing wood as distinct from mere growth; but the former are pruned for foundational work, and until the framework is well and truly laid no thought whatever is given to fruit. We do not expect, neither do we want, to see such young trees carrying fruit; in fact, we ought not to permit them to—but we do want to see them producing stout shoots in the right positions, wood that will build up for the tree a healthy and virile constitution. When we have secured that, and not before, we turn our attention to fruit. In order that the wood may be evenly distributed and balanced, and that right direction is given to it, the pruning must be to an eye pointing in that direction and away from the centre of the tree. It must be an eye facing outward, for at all stages of growth the centre of the tree should be uncrowded and open. It is often necessary to entirely remove shoots which violate that rule, and this can best be done at the time of summer stopping, when such shoots are only incipient. This summer pruning, or, as we prefer to call it, summer stopping, is done in July, when the growths have not hardened and have served the purpose of using up some of the tree's superabundant sap. We would rather be able to pinch these than cut them. We shall refer to this matter later when dealing with fruit trees.

Cultivation

The cultivation and making of the young trees cannot proceed satisfactorily unless due attention is bestowed on the well-being of the roots, and the keeping of the foliage free from the ravages of insects. In February, the pointing of the soil should be done as recommended for the maidens, only more so, inasmuch as the digging might be deeper. If the soil needs it, work in some well-rotted manure, but manured or not, the soil will benefit by increased aeration. Also, it is advisable to dress at least once with a good and proved soil insecticide, for though we consider a few hens to be the best insect hunters we have, their place is decidedly not in the young tree quarters of a nursery. Should there be an objection to the use of a soil insecticide, though why there should be we cannot see, then spring dressings of newly slaked lime may be given

occasionally, and though it may nor exterminate all the insects, it will do the soil, and the trees, good.

The summer spraying of the young stock ought to be done regularly from May till September, for no youngling can healthily develop if its leaves are foul and congested with the excreta of the insects preying upon them; but even this is a light matter if compared with their constant feeding on the cells and tissues. And when in spite of the spraying these pests will come, then the washing should be resorted to as explained in the last chapter. Do this before the attacking hordes get out of hand, for often and often have we seen strong, promising shoots stopped short in their growth and stunted at half their proper length through the ravages of the pests swarming upon them. There is no part of their cultivation that we insist more strongly upon than their general cleanliness and freedom from insect pests. The woolly aphis, or American blight, should especially be guarded against, for their damage is even worse. They attack the tree through the bark and cripple the circulatory system. The nodules they raise easily develop into canker and so spoil the tree. We have ourselves received trained apples which have so suffered from this pest that we dared not plant them, but have returned them to the sender.

Beyond the pruning, digging, and cleansing, the work during the second and third year is routine, except where trained trees are in the making, and there is more detail involved in this than in any other form of tree. The removal of projecting shoots from the front and back of the trees, leaving those only which are growing in a lateral direction at regular intervals, and the training of them in position as shown in Fig. 18, is not such a mechanical operation as it would look. It is really work for the expert, and this is shown by the difference in value between an espalier and a tree of any other shape of a similar age. Our illustration shows both second and third year growths, and the mark thus \ shows where the former was pruned back at the end of the second year.

Cordons

A word or two on the making of a cordon will not be out of place here. The treatment can be fairly followed by a study of Fig. 17,

but something remains to be said. All non-fruiting growths are nipped back at an early stage, but there is a principle involved in the amount of foliage retained which must be adhered to. Some good people think that this must be reduced to the lowest possible minimum, but we think there is a limit beyond which it is dangerous to go. The fruiting spurs, which are encouraged here at the expense of nearly everything else, carry a certain amount of foliage of their own, enough perhaps to develop themselves without contributing much to the general welfare of the tree. But there is not only the health of the tree to be provided for ; there is a crop of fruit, and with an insufficiency of foliage to maintain vitality and growth the tree would stand still and prematurely age, and the fruit would be lacking in size. This foliage is supplied by leaving a portion of the summer growths shortened back to within a few inches of their base. Afterwards, if these are not required for the formation of new spurs, they can be completely removed when pruning. We know, without being botanists, that the leaves of a tree are its lungs, and that they are as essential to growth and health as the roots are. In the cordon tree, possessing but a meagre superficial area, foliage may be rigidly kept within bounds, not to a hard and fast minimum, but in strict accord with its healthy maintenance, determined by a study of the tree itself. Deprived of too much foliage it will age prematurely or canker. We shall find an opportunity of again referring to cordons, for in the days of more intensive cultivation, which are yet to come, we believe the cordon will come into its own and become a much greater factor in the economy of the fruit farm than it has hitherto been. There will be a great development when we have advanced a little further in our scientific knowledge of stocks. At least, we think so. The making of trees, though largely determined during the first three years of their existence, goes on for some years, not often developing new lines so much as consolidating and improving those given earlier. When they are permanently planted and established in their new home, that work is taken up again and carried on until the tree has developed and we have the perfect fruit producer. We have dwelt at some length upon their beginnings, because, after all, that is the most important period. Like as we take the greatest pains in educating our children while they are yet young and form them while yet they are receptive

and malleable, so do we form and direct our trees while yet they are amenable to our treatment. But the work must go on and on and on, and we shall hope in the succeeding chapters to offer such advice, in its place, as may be instructive and helpful.

Although we have used the names apples, pears, plums, the making of cherries, peaches, and apricots is an identical process from the budding or the grafting up to the stage we have now reached. The training of peaches and Morello cherries is only more involved because there are a greater number of growths to deal with, but the routine is much the same; and there are also far more lateral growths in peaches, and these have to be removed during the summer and before they have become strong. As, however, apricots and peaches are seldom classed as orchard fruit we do not think it advisable to treat specifically of their cultivation.

CHAPTER VIII

PLANTING

At what age should a tree be planted into its permanent position ? That is one of the simplest of questions, but not so easy to answer. It is a very controversial subject, upon which experts will, we think, never agree, which appeals different ways to different minds, and upon which no sane writer would permit himself to dogmatize. In examining the opinions and arguments of others, we can do so without feeling any particularly burning desire to controvert them. We can also state our own opinions and the reasons for them, still open to be convinced otherwise, and these we can leave in the hands of those interested, admitting candidly that we respect much of what can be urged against them. In short, we refuse to be dogmatic. How can we be when even in practice we allow circumstances to count, and do not bind ourselves to any hard and fast rule ?

Shall we plant out the maidens ? Those who think we should, and who do it themselves, hold that the check in transplanting maidens is considerably less, and less felt, than with older trees ; and further, that they have the making and the shaping of the trees in their own hands. No one will have the hardihood to gainsay them. At the other extreme are growers who prefer to plant four year or five year trees—that is, trees of a fruit-bearing age, because they are not placed under the necessity of waiting several years without getting any return for their outlay.

We see the force of the argument, but cannot adopt it for our own ; for this, examined closely, is more a matter of temperament than anything else and is not solely concerned with the future of the tree. Others there are, again, who pin their faith to the two-year-old trees as the best and most economical to plant, and we can go a very long way with those who hold this view. We confess to a partiality for two year trees because the root-system is more developed than that of the maidens, without being so far advanced as to suffer in transplanting ; and, in addition, they give a clearer indication as to whether they will form the kind of tree we require.

FIG. 21.—A six feet Standard Apple (four years)

But our own inclination runs strongly toward the three year trees, with their foundations already laid, their form defined, and a well-developed root-system, not too advanced to move with perfect safety. We think they can better and more satisfactorily perform the initial stages of their work if left without the check which transplanting must of necessity impose, and the first season after transplanting affords the opportunity for consolidating what has been made while new roots are in process of making to supply the energy for a good send-off the following season. Whatever advantages may be found in unchecked youthful vigour, and they must be many, belong to the three-year-old trees, and they enjoy the full benefit of them. As to the planting of older stock, though we may under certain circumstances do this, we would not like to adopt it as a regular practice. The three year tree has, from the time the stock is planted, been in the ground for four years, and by that time has created a very considerable system of roots. Experience tells us that at this age it can be transplanted with perfect safety and, if planted early, scarcely feel the check; but even one additional year marks so great a difference in the rapidly developing roots that the check is greater and more keenly felt. But to pass on —at three years, the standard *is* a standard; the pyramid *is* a pyramid; the bush *is* a bush; and the half-standard *is* a half-standard, and this cannot be claimed for them at any earlier age.

Preparing the Ground

Experiments sometimes furnish some very startling results, and statistics, we are told, can be made to prove anything. Experiments have, we believe, shown that it is possible to dig a small hole in unprepared soil, stuff it full of roots, no matter how crowded, so that the anchorage will hold the tree, and that the said tree will thrive and do as well as one planted with care and after due preparation. This, we say, has been proved possible—so have many other things; but we whose bread and cheese are involved do not run after such possibilities. What we want is not even the probable, but the "certain." We do not underestimate the value of experiment; indeed, we have experienced its value again and again, but we always look upon them *as* experiments until they are well out of that stage.

We believe most strongly and stubbornly in the careful preparation of any land about to be permanently planted with fruit. Almost anything can be done with it before the trees are planted, but for ever afterwards there are limitations.

Some years ago, to be precise it was in 1894, we planted a large acreage of fruit trees not many miles from London. We most carefully prepared, as we shall show. We selected every tree and planted with the utmost care, with the result that though a sharp winter immediately followed, not a single tree succumbed. Success appeared to be so well assured during the first season that we found an imitator in a neighbour farmer, but he supposed he could achieve similar results without incurring the same expenses we had been put to. If our land showed promise as a fruit farm, why should not his, seeing his field was contiguous and of similar soil ? He dug his holes even without ploughing his land ; he went to an auction sale and bought trees of sundry kinds at less than half the price we paid ; he planted them in a rough-and-ready way, and five years after his best trees were no larger than when planted, many were stunted and cankered, but the majority had died and were never replaced. It is not to be wondered at that this farmer ever afterward condemned fruit growing in no measured terms. How very different was our experience !

The land we planted had for years borne the regular crops of cereals and roots. The soil was good and deep, but practically farmed out. It was foul, as much of the land was in those worst years of agricultural depression. The summer happened to be hot and dry and was ideal for the cleaning. We hired steam tackle and cultivated athwart and across, not more than 1 foot deep, thus keeping the rubbish on top. Over this the harrows were passed, and when the sun had dried the spear grass and thistles these weeds were raked into rows and burnt. Then the cultivators were put in again, penetrating another foot and the process of cleaning was repeated. Throughout September the land lay resting ; in October manure was carted on, the plough followed, and all was ready by the end of the month. Meanwhile the best nurseries in the country had been visited and the requisite number of trees, many hundreds, were selected. They were carefully lifted, packed into railway trucks, and brought home. Holes were dug in readiness,

and the planting was expeditiously done under our personal supervision. The rows were each a furlong in length, and considerable pride was taken in setting the lines as perfectly straight as an arrow. The result was one of the best fruit plantations to be found in the country at that date and now a very valuable property. No less thorough preparations could have brought the same results, and we advocate thorough preparatory work as the soundest of economy and essential to success.

Varieties

In the selection of varieties, it is not well to place implicit reliance on, or be entirely governed by, what one can see at a large exhibition of fruit. Of course very much valuable information can be gleaned from the contents of the tables, but we shall show that this is not an infallible guide.

We think it a grave mistake for any grower for market to encumber himself with too many varieties of anything. "Strong lines" should be the motto, that is: good standard market varieties in such quantities as to market in bulk. He who can offer a few bushels or a few hundredweights of, say, Cox's Orange, is not in such a commanding position to influence prices as he who has as many tons. This is such a well-established fact that the wonder is anyone should be so ill-advised as to act contrary to it. Whether it be a question of apples or plums, pears or cherries, gooseberries or strawberries, it applies equally, and, making due allowance for succession, there should be few varieties in large quantities rather than numerous varieties in smaller quantities of each. At every fruit conference this fact is emphasized, as also is the expert opinions as to what and which are, generally, the best varieties to grow. There can be no excuse for any prospective planters to remain in ignorance, and if some will obstinately adhere to preconceived ideas against those of the greatest authorities, it must be accounted as obstinacy rather than the want of being told.

It is found to be a very convenient and economic arrangement to select varieties that can bring grist to the mill throughout a prolonged season, and for this early, mid-season, and late varieties, in their varying degrees, should be planted. We are not quite sure that this plan aggregates most grist, but its recommendation is its

convenience. We may refer to apples as an example where the season beginning with Victoria and Beauty of Bath would carry on without a break till the last Bramley's Seedling were sold at Easter.

We should find it comparatively easy to write a list of varieties and their order of succession if we thought we could do so with advantage to our readers, but there is one consideration which, to our minds, would make such a list of little value, apart from the fact that they are so presented in nurserymen's lists ; and that is, that a list could not be a reliable guide, because what may be best for one district is not the best for another. For example, on some soils and in some localities the Jargonelle pear is everything that can be wished, while in others (perhaps the majority) it is unprofitable and unsatisfactory. In some places Royal Sovereign strawberry is " the one and only " ; in others, it gives pride of place to Paxton. Some districts suit Rivers' Early plum, while others can only do The Czar. So, with these very grave discrepancies and differences, we could not with any advantage offer a selection, but we can offer one piece of advice, viz. get to know first of all what will do best in your district, and when you know that, get further to know what are the best lines in the market, and arrange the closest possible agreement between them.

Neither does our personal experience encourage us to volunteer a selection, this having often turned out most unsatisfactorily for us ; for when we have been professionally consulted and given of our best and specialized knowledge, we have often found that the *viva voce* advice of a man on the spot, with nothing but an empiric and superficial knowledge of the trade, with no conception of its inner workings, is more promptly accepted and acted upon, but not often with good results. In our opinion, those who are incapable of making their selection are not sufficiently advanced to safely launch out on their own account, and it would be time well and properly spent if they offered their services for a year in exchange for experience on a well-run fruit farm.

We have already alluded to the need for great care in planting. Holes of an ample size to accommodate the full spread of roots must be opened, so that there shall be no cramping and doubling back. These holes must be shallow, and if the soil has not been deeply worked, a lower spit should be well dug and then trodden

down. Almost invariably a mark on the stem denotes the depth to which the tree had been formerly planted—let that be your guide, planting about an inch deeper. The roots, spread out horizontally, will be probably about 6 inches below the surface, and this is deep enough if a stake is driven in to support the tree. To plant too deep is to induce canker.

Distances

The distances apart at which to plant must be decided by the character of the trees and the stocks upon which they are worked. Orchard trees, that is, standards and half-standards on the " free " stock, should be given ample space, for it is not economical to cut down every alternate tree after it has got to full bearing. Full standard apples, pears, and plums ought to be 30 feet apart, and the intervals may be filled with bushes on dwarfing stocks if thought advisable. Bush trees, on either the " dwarfing " or the " free " stocks, when planted permanently should be about 15 feet and 18 feet apart respectively, and will last for many years if well attended to. Standard cherries and the looser growing varieties of pears need more space, and 36 feet to 40 feet will not be more than sufficient. We are aware that these distances somewhat exceed those generally adopted years ago, but it has been forced in upon us that more open planting is really hygienic and provides the most favourable conditions for successfully combating insect pests. It also gives a freer admission to the light and air, and, as we know, these are the great ripening agencies, both for fruit and the wood of the trees. Well-ripened wood is the first essential to fertility. It will be found that at these distances the heads of the trees in a few years will occupy a great deal of the space, and it is only then that the advantages of a few extra feet for each tree will fully compensate for the slightly reduced number per acre. We are asking you to give your trees every possible chance, knowing that in the long run you will be repaid.

CHAPTER IX

DWARF TREES AND CORDONS

WITH the greater knowledge of the various fruit stocks now in process of development, which will in the very near future have an increasing influence on the character of young trees, we shall undoubtedly rear and plant a greater proportion of dwarfs than hitherto. Notwithstanding its variability, this type of tree has long been popular, but limits have been set to its use. Compared with the free orchard trees it has a comparatively short life, and in its age tails off into the production of second-size fruit; but even though its life is shorter, it must become more and more a matter of practical politics, by reason of its economy in space, its precociousness and fecundity, it will yield quicker, yet adequate, returns than the freer growing and longer lived trees of the orchard.

We do not infer by this that dwarf trees will ever supplant those on the " free " stock; this they will never do, and, if for no other reason, then because certain varieties of apples, pears, and plums will only do their best when they are on such stocks; but what we think is that dwarfs will become a much more important supplement to the others and be planted in considerably increased quantities, and that, not only because in its turn, it is the best stock for certain varieties.

The fact is, that as the times are changing, ideas are changing with them. The label " Quick Returns " has a tremendous attraction in these days, far more than in the quiet and complacent days of the past. Then, a man would plant an orchard, firmly convinced that he was planting for the benefit of his immediate successors, scarcely expecting to himself reap the reward of his labour unless he enjoyed some years of life in excess of the average. And, in practice, he was more often right than wrong. In our dwarfs we have a type of tree which from the age of three years begins to give returns, and at five years are profitable. Supposing they *are* short-lived, what then? If during that short life they have been grown and yielded a profit equal to that of any other crop, then they have

been worth the growing, and their fifteen or twenty years cannot be considered a short crop.

It is, perhaps, as a purely supplementary crop that they can be most profitably planted, say, between the rows and, in the rows, between the more permanent orchard trees. They must, of course, be planted when the orchard is made so as to do their bit while the permanent trees are in the making and before they grow too large. In this way they ensure a regular return from ground that would otherwise be barren of results where ordinary bush fruit was not grown. We have so grown them for years with perfectly satisfactory results, and these we hope to improve upon by and by. When it has been objected to us that the cost of the trees was prohibitive, we point to the fact that we raise our own trees and they directly cost but little, and that little we scarcely feel. It is a fact that some of the finest exhibition fruit we have ever gathered came from these dwarf trees.

Dwarfs appeal to others perhaps more strongly than to commercial growers, and the amateur with a keen perception of things finds in these dwarf trees a type which he can make quite a hobby of. But the qualities which recommend them to such are the very qualities which should commend them to the purely commercial man. They are get-at-able ; are always under close observation ; their condition, their needs, the attacks of pests, are all immediately noticeable and can be dealt with promptly and easily, while trees of a larger and free-growing type are more difficult to deal with and more out of the line of sight.

There can be no question as to the quality of fruit produced by them, and we may instance the following, as varieties we have grown, in every respect of the highest quality and good enough to serve us in illustrating lectures, viz. Apples: Lane's Prince Albert; King of the Pippins ; Peasgood's Nonsuch ; Newton Wonder ; James Grieve ; Blenheim Orange ; Golden Spire ; Wellington ; Worcester Pearmain ; and Cox's Orange. Pears : Doyenne du Comice ; Durondeau ; Louise Bonne of Jersey ; Dr. Jules Guillot ; Williams' Bon-Chrétien ; and various others.

Practically the trees prune themselves and need but a modicum of help. Their growth is naturally meagre if on correct stocks, and their heavy cropping qualities act as a strong curb even on this, so

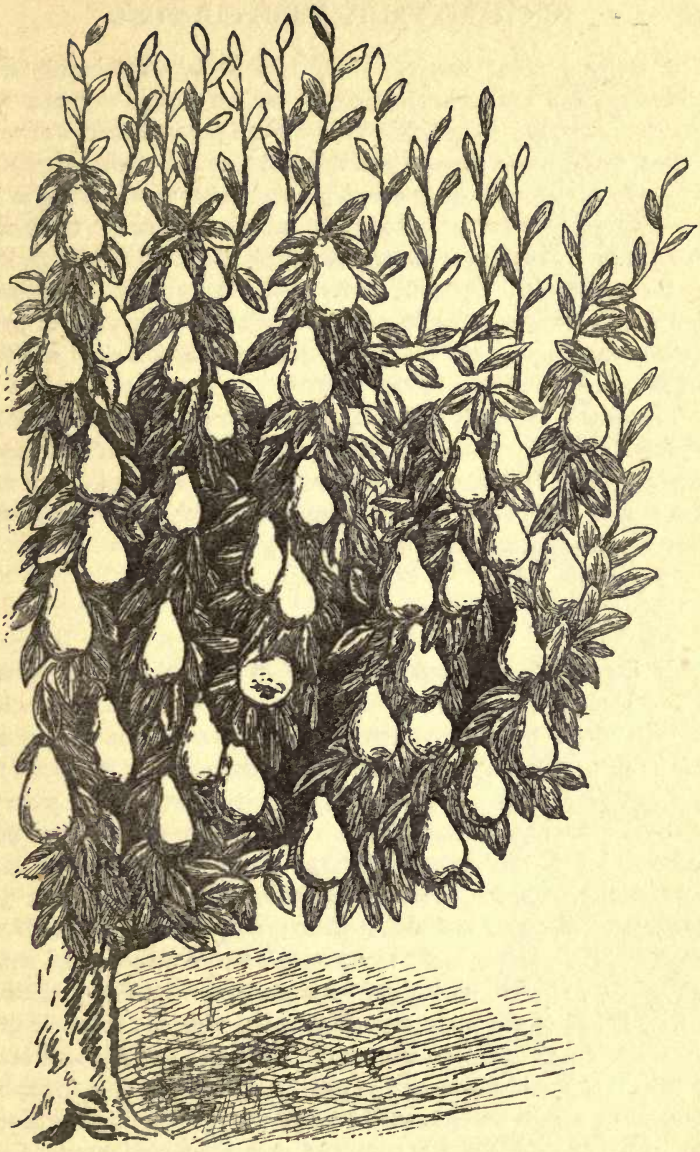

FIG. 22.—Bush Pear, Pitmaston Duchesse

Their successful open cultivation, as shown by this heavily fruited tree. The above section was sketched on the spot

that really pruning resolves itself into judicious thinning and trimming, and the maintenance of sufficient foliage to foster the health of the tree. To produce the latter the pruner has, to a certain extent, to encourage growth, and this is the reverse of the treatment generally necessary to large growing trees, but the whole thing is so beautifully under control. To keep them in perfect health is the one desideratum, and, having encompassed this, the fruiting may be left to the tree itself. There is, however, one thing to guard against, and that is, overcropping, for if this is allowed the sample of fruit quickly deteriorates, the energies of the tree are exhausted and the results are stunted growth and canker.

The distance apart at which to plant dwarf trees is from 6 feet to 7½ feet. In the nursery beds from which sales are made we plant as closely as 4 feet, but in permanent positions we recommend not less than 6 feet, while we would suggest that the more vigorous-growing varieties would profitably fill 7½ feet.

Cordons

Having already dealt sufficiently with the first three years in the life of a cordon, we have touched upon all that is most important and vital to it. But there remains something yet to be said concerning its future development. The tree is formed, but it cannot be said to be *made* when it has passed its third year, and the process of development must continue till its full stature has been reached and nothing further is required than to maintain its health and prŏductivity. Cordon trees, like all other forms, depend upon the intelligence directing and aiding them ; they become profitable or unprofitable according to the treatment given. When we see a well-grown cordon in full bearing and measure the weight of fruit against the smallness of the space occupied by the tree, we are, perhaps, too apt to resort to figures and multiply the weight by the number of trees that would fill an acre of ground, and so arrive at the most astounding results—which would be all wrong. But do not fear ; results never work out that way, and such a calculation would be foolhardy for any person who banked on the results. Incidentally, there are too many such calculations in the horticultural world, and we do most strongly deprecate the practice of trying to make Dame

Nature conform to mathematics. We are old, and in our time have repeatedly met with this inane way of calculating, and have witnessed the dashing to the ground and the confusing of every hope based on such foundations of sand. The "old lady" laughs at our laws and at our cleverness and goes quietly on her way, caring little for the "calculated fancies" she tramples in the dust.

The profitable cultivation of cordon fruit trees has been fully and strongly demonstrated by a select number of growers who have specialized in them. We could name some who have made their mark and established themselves on the market through the exceeding excellence of their products. They make a special study of the system, the cultivation, pruning and feeding, thinning the crops, and every detail pertaining to the trees and the soil in which they grow. Their fruit, far exceeding the average in quality and finish, is carefully graded and packed in special small parcels, being sold to special clients by count and not by weight. Their aim is to produce extra high-grade fruit beyond the possibility of being brought into competition with that of a more ordinary sample, and they restrict their varieties to those possessing "sell-at-sight" qualities. There is room for many more high-grade growers like them; indeed, it is only a question of time before the exigencies of the trade force us to adopt something approximating to their standards if we would make growing pay;

FIG. 23

Pitmaston Duchesse Single Cordon

and what we are coming to is this : that while the close study of methods may, and do, account for much in which they excel, something, aye, a great deal, must be credited to the form of tree upon which their fruit is grown, viz. the cordon.

The cultivation of cordons, after they have been transplanted to their permanent quarters, should follow on the principles laid down in our treatment of the three-year-old trees in Chapter VII. Each year should add not less than 1 foot to their height until the limits have been reached. When, in the course of time, it becomes necessary to remove old and exhausted spurs, others should be provided to fill their spaces if the health and vigour of the tree remains equal to supporting them. That balance of foliage, necessary to the health of any tree, and more particularly to fruit-bearing trees, must be maintained ; for if it is not sufficient to do all that foliage is meant to do the fruit will quickly feel it and deteriorate in size. The wood, reserved for this purpose, should be pruned back every year to about three eyes, and all superfluous growths, not actually necessary to the health of the tree, completely removed.

In proportion to their size, cordons are heavy croppers, and the grower, after deciding how much the individual tree can mature and perfect, will thin the crop down to that quantity. He will feel no remorse in removing fruit which if retained would entirely defeat his objects. We have seen Allington Pippin and Cox's Orange hanging so thickly on cordons that the fruit could not swell beyond the size of a crab, and as marketable stuff was useless.

The most select varieties only, of apples or pears, should be so grown, for such strong growing apples as Ecklinville, Warner's King, Lord Derby, etc., cannot, on cordons, show any advantage over those on other forms. They can, of course, be grown and do well, but generally the fruit is scarcely so large. The choicest medium-sized dessert varieties are, however, improved in size and appearance, and consequently the very finest samples are obtained from the cordon. With pears it is somewhat different. As seen by our illustrations, Pitmaston Duchesse forms an ideal cordon, the weight of crop generally counteracting any tendency to coarse growth.

By judicious pruning and pinching the fruiting spurs can be kept within decent bounds, and there is no good reason why they

should become attenuated and spreading, as we see them in so many places. Such spurs do not produce the finest quality fruit. A well-tended tree should be columnar and should not greatly exceed 1 foot in diameter when in its prime.

Trees so completely under control, and therefore not "naturally" grown, demand very special care for their health, more particularly directed perhaps to the healthy functioning of the roots. The soil about them must be constantly cultivated, that is, stirred and cleaned, and the feeding very carefully considered. Natural manures must not be stinted, even as they must not be overdone, and should be applied in the autumn. But it will be found that when the trees are bearing their greatest strain some immediately available stimulant will prove very helpful. We are not enamoured of violent acting agents, like nitrate of soda, or anything likely to have detrimental after-effects upon the soil, but choose rather such manures as bone meal, super-phosphates, or a really good guano of approved analyses. In dry weather we apply them in solution. Our own experiences and the whole balance of evidence go to prove the value of fertilizers when judiciously used in accordance with printed instructions, though we would be careful to point out that we do not depend entirely upon them, looking upon them as stimulants to be used as supplementary to and not instead of natural manure.

FIG. 24.—Apple Single Cordon

Closely connected with the health of the tree is the perfect functioning of the leaves, and to secure this they must be kept clean. There can be no excuse for the presence of destructive insect pests on trees, every twig and every leaf of which is well within reach. A knapsack sprayer and a jar of insecticide locked away in the shed are not going to scare away the pests; they must be used. Grease-banding and spraying ought to be part of the regular routine, and deterrents used in preference to remedies. When the latter are necessary, do not delay their use a single hour.

One other detail: root-pruning. The trees will themselves tell

you where and when this should be done. It is not one of those operations to be performed whether it is necessary or not. When a cordon is showing itself vigorous by throwing out too much free growth then root-pruning is necessary as a corrective; but if it shows itself to be only healthy and able to preserve the balance between fruiting and non-fruiting wood, with just a balance in favour of the latter to demonstrate its capabilities, then do not interfere with the roots, but trust to the crop to keep down redundancy.

We remarked above that there was room for more growers of high-grade fruit, which is but another interpretation of the old axiom "there is always room on top." When we have passed through large private gardens and have seen to what perfection the skilled gardener has brought his cordons and the wonderful results he obtains, we have turned to our market-growing friends and said, "Go, and do likewise." And why should they not? It may be objected that they have to grow on a commercial basis, and that the private gardener has not; but be that as it may, the latter produce demonstrably profitable crops, and in quantity and quality leads the way. And why? We have yet to learn that the skill of the private gardener, taken as a class, is in any way superior to that of the commercial grower; in fact, we do not think that "we imagine a vain thing" when we suggest that the boot is on the other foot, and if that indeed be so, it becomes simply a matter of ways and means of application.

CHAPTER X

BUSH FRUITS

We cannot well write of orchard tree culture and ignore a quite important department of commercial fruit growing, viz. that of bush fruits. Even if we limit our observations to the raising and cultivation of gooseberries and currants, we shall still be dealing with a line of very great importance, and of considerable economic value to the fruit-grower.

We have very good reason for believing that great strides will soon be made and that hundreds of acres of gooseberries and currants will be planted in the very near future. At present they are looked upon with suspicion, the former because of the prevalence of American Mildew, the latter because of " big bud " and " reversion." True, these devastating foes are, for the moment, uppermost; but we trust that no one will suggest that science has said its last words concerning them ! We should not believe them unless science was to belie all its traditions; and we, for our part, obstinately hold to the conviction that so surely as the sun will in due course dissipate the clouds now hiding it from us, so surely will " American Mildew " and " big bud " be conquered. That is our faith; and when this consummation is attained fruit bushes will be at a premium.

In our remarks on the raising and cultivation of these fruits, we may look upon them as one, seeing that they require identical treatment. This begins with the cuttings, which are made during October and November from ripened wood of the current year's growth made in lengths of from 10 inches to a foot. But there is one slight, yet important, difference between the making of a black currant cutting and that of a red currant or gooseberry. The majority of growers prefer their gooseberries and red and white currants grown with a leg, that is, as dwarf standards, but their black currants grown as " stools." The reason why the latter are not grown with a leg is that the top growth is spreading and heavy, so that as the bush ages large portions are apt to break off under the weight of crop, or as the result of wind or other pressure. This

does not happen to growths thrown up from the ground, or to branches springing from such growths.

The time to think of and to provide for this is when the cuttings are made, as while it is the general practice to remove all except the two or three upper eyes from those of red and white currants and gooseberries, those of the black currant are left in their entirety, and the types of plants are produced as shown in our illustrations. Do not, however, let us be understood as saying that black currants are invariably grown as stools, because this is not so. There are people, especially amateurs, who prefer to grow them on stems, as the other currants are, and nurserymen find this a convenient form in which to grow them for sale, possibly because they are more shapely; so while we express our preference (for market purposes) for the " stooled " black currant, we have not a word to say in opposition to those who differ from us—it is not a point of serious import.

While we pride ourselves with being among the Progressives, we must confess to an unbending conservatism respecting the making of cuttings. It is perhaps an unimportant, but still significant, point, as indicating the changed methods of the times, from the reasoned and ordered methods of the past to those of the push and rush of the present day, that many advisers on the making of cuttings say " cut pieces of ripened wood into lengths," presumably irrespective of *where* you are to cut them. It is on this point we are old-fashioned and precise, for we insist upon the advisability of making the lower cut immediately below an eye, and the top cut immediately above one. It may be that no better results ensue—we do not maintain that they do—but ours is a long-tried and well-tested method, against which the newer methods appear to be slovenly. So far as we are able to do so we advocate only those methods and practices upon which we can speak with conviction, based on our own experience.

The best soil in which to strike cuttings is one that is open, friable, and well worked to the depth of 1 foot. In badly tilled, close, or heavy soils they will doubtless strike, but the roots are very meagre and the top growth sparse—they do not make a propitious start towards vigorous, healthy bushes. We open the usual trench in order to give ourselves working facilities, then

digging a spit wide along the whole length of the row we place our line, level and firm the surface with the back of our spade, and cut out a clean trench 9 inches deep with a perfectly level bottom on which the base of each cutting can rest. The back wall of the trench is slightly sloping, as clean and even as a brick wall, and against this the whole length of the cutting rests in close contact with the soil, except the two top eyes which rise above the ground level after the trench is filled in. Where large quantities have to be inserted, 2 inches from cutting to cutting is as much space as can well be afforded; and indeed that space generally proves sufficient, though an extra inch would be an advantage to the growing plants during the summer.

In filling in the trench care is taken first that every cutting rests upon a firm base, and also that it is in close contact with the wall of the trench: and this being assured, the trench is about half filled in and then the soil trodden about the base of the cuttings. The remainder of the soil is then added and trodden, not too hard, and another spit is dug, levelled, and firmed with the spade, and the process repeated row after row, leaving 10 or 12 inches between them.

Throughout the year during which the cuttings occupy the bed, their treatment is not exacting. The action of frost upon the soil shows itself after the thaw by having loosened it, so that it does not hold the cuttings in the tight grip we made a point of insuring. This is easily tested, and where there is a looseness the soil between the rows should be well trodden, but not until it has dried. There will be no need for stamping, just the steady even pressure of the foot and the grip will be again restored. More especially must this be done after late frosts, for in quite the early spring the cuttings begin to work both at top and bottom, and a few days' experience of a loose soil, and perhaps a penetrating drying wind, is capable of much mischief.

As early as March begin to keep the surface of the soil stirred with the hoe, and practically throughout the whole summer periodical hoeing is the only attention needed. But it must be periodic if we wish to get strong growths on our cuttings, for the advantages of regular hoeing are very marked in the case of cuttings of any kind, and are too well known to need recapitulation here.

In October or early November the cuttings must be lifted and trimmed, then transplanted into nursery quarters or beds, at distances of 12 inches apart in the rows and 15 inches to 18 inches between the rows. They must not be planted too deeply, and the roots should not be more than 4 inches or 5 inches below the surface. If this work is put in hand at the date suggested, the young bushes will at once make many new roots and will be established before winter. Thus they start off in the early spring with everything in

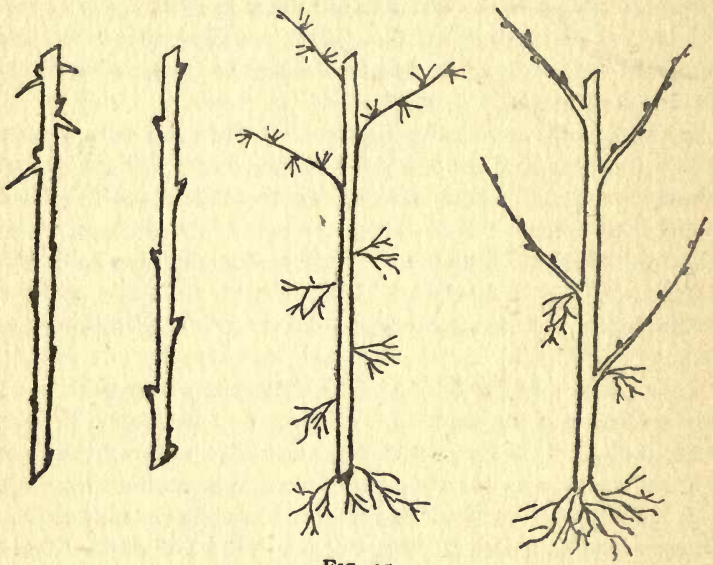

FIG. 25

Gooseberry Black Currant As made October, 1920 — Same as lifted October, 1921

their favour, whereas if planting is delayed until December the "send off" is not nearly so advantageous. In March it will be necessary to go over all the stock and prune hard back to within two or three eyes, cutting always at an eye looking outward ; the ensuing growths will then be increased in number and their growth vigorous. If this pruning is missed, the stock is practically spoilt, or at the very best a whole year is wasted. If grown and treated according to these instructions they should make good during the following season and be ready for planting out at two years old.

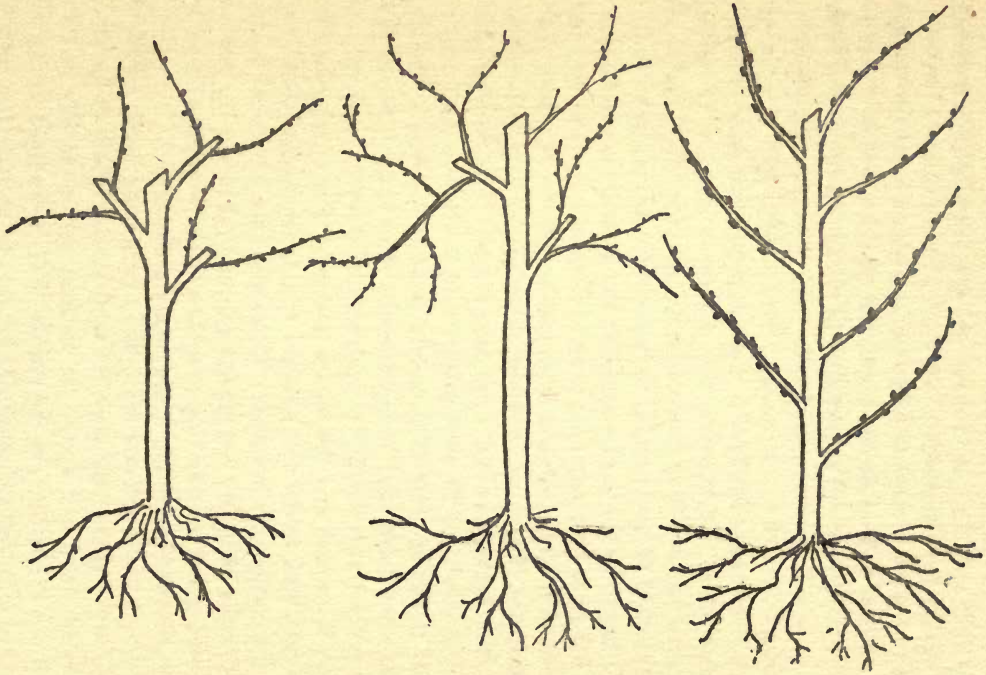

FIG. 26

Two-year Red Currant | Three-year Red Currant | Two-year Black Currant

Gooseberries or red and white currants do not require a heavy soil and are not over particular in its character provided it is well drained, thoroughly cultivated and manured. A warm, deep, fairly light soil, such as in many old gardens has been cultivated and nursed for generations, will produce magnificent berries and plenty of them if there is sufficient nourishment. Black currants will do very well on the same soil, but on the whole they prefer a heavier and richer soil not deficient in silica. Having regard to the size to which healthy gooseberries and currants will attain, we consider that from row to row and from plant to plant the distance should not be less than 6 feet. Let this planting be done as early as possible after mid-October, for the same purpose of making autumn roots as already referred to, and again in March follow the same method of hard pruning to increase the size of the bushes.

We have now the bushes complete and in their permanent quarters, but we feel we ought not to leave them without some reference to their after treatment, and more particularly the pruning. As to gooseberries, though we have seen these pruned hard and crowded with fruit spurs, that is not the custom when large numbers have to be handled. With most market men it resolves itself into an annual trimming away of immature wood and a drastic thinning out of what is crowded or superfluous. The heart of the bush is kept as open as is possible ; weak wood is discarded and only the young, the strong and the robust retained. The outer shoots are shortened back to the first outward eye on the ripened wood, and only the unripe ends removed. Those who have a fancy for cordon gooseberries (these are not market growers) follow out the method of pinching and spur-making as spoken of previously, and trees so grown are very interesting if not always profitable.

Red and white currants are pruned back hard every season to within a few eyes of the base, for these produce fruit on specially developed wood and spurs. It weakens and eventually spoils a tree if this is not done, as the sample of fruit produced would not be looked at by any self-respecting buyer—not even the jam makers. To produce luscious clusters of good fat berries the hard pruning of the current season's wood every autumn must be effected.

Black currants are different. As these produce their berries on the previous year's growths, it is obvious that you cannot prune

back without sacrificing the fruit ; therefore the strong shoots are left intact, the weaker ones cut back to induce stronger growth, and any superfluous ones, especially if rising up the centre of the bush, removed and made into cuttings.

Bush fruit when grown to a good sample is looked upon as a profitable crop which it is scarcely possible to overdo. But the sample must be good if prices are to be good, for there is much inferior fruit marketed which does not pay the expenses of gathering and selling.

CHAPTER XI

SOME IMPORTANT POINTS

BEYOND the point to which we have brought our trees we need add little further, as they have got past their nursery stage when established in their permanent positions. Yet there still remain a few important matters we have scarcely touched upon, and others, belonging more to the future, we ought not to pass by. If our subject had been that of " Fruit Growing for Market," we should want at least three such books as this to deal faithfully with it, and even then could not have exhausted it. So we have done what we set out to do, and have brought the young tree from its creation to its " coming of age." We, however, still retain our interest in it as will be seen.

PRUNING

The subject of pruning is a much debated one, and a considerable diversity of opinion is held. Of course, we have decided views of our own, as all have who are worth their salt. No one could possibly succeed who did not follow out a definite course year after year. He who wobbles and works from one method to another gives no method a chance, and ends up in a muddle.

Broadly speaking, young trees require hard pruning until their framework is satisfactory and until they are permanently established, after which it must be regulated toward the keeping of a well-balanced tree and the production of good fruiting wood or spurs. The centre of the tree must be kept open, and extension made outward, not inward. If growth is too rank, prune the top less severely, but go for the roots. When we root-prune established fruit trees we root-prune twice. One year we open a trench half-way round 2 to 3 feet away from the trunk, according to the size of the tree, and sever all the thick roots we find, even exploring for and severing any tap-roots. We fill in with fresh soil. Then after one year we treat the other half in the same way, and this always acts as a very effectual corrective to rank growth.

We suppose the most debatable point raised about pruning is whether a newly planted tree should be pruned, or left for a year.

Argument has raged fiercely over this, but we hold the opinion that the question is raised in a wrong form. Put in the form we should like to see it, which we think would be more to the purpose, the answer would be easier. We would ask—"Should fruit trees be pruned before they are established?" To this we reply without hesitation, "No." If the roots of the tree have established a hold upon the soil and can function satisfactorily, then the head may be pruned, within reason, with impunity, but to severely prune a tree before its roots have recovered from the transplanting is to impose a double check which it is scarcely in a condition to withstand. An established tree starts into growth considerably in advance of one newly planted, and the breaks at each cut get the advantage of a full season's growth and are strong. The newly planted tree has to make roots before it can make growth—the flow of the sap is slow, therefore the new breaks are late and only show half the strength of their earlier and more fortunate friends. Now a tree planted anywhere between mid-October and mid-November, while the soil is comparatively warm,—the earlier the better—makes a quantity of new roots which take hold of the soil and so—from our present point of view—is virtually established and starts growing quite early; but a tree planted in December or in the spring does not begin to root until quite late, and remains backward throughout the season. Thus it amounts to this: Plant early and prune; plant late and do not prune. Those are the results we arrived at, not after a few isolated experiments, but after many years' experience.

Whatever pruning is necessary, it is generally advisable to get it done by the end of the year, because the wound hardens and heals, the cells close up, and there is no loss of sap, which is loss of strength. This is so obvious that there should be no need for pointing it out, but that we are aware how widely spread is the custom of putting the work off till February. The work is as urgent and important as any other, and ought not to be delayed as a mere matter of convenience.

Stone Fruit

We have devoted but few remarks to the subject of stone fruits. Apricots and peaches can scarcely be looked upon as orchard fruits, for they are only so grown in a few favoured spots in the south-west.

They interest the private rather than the ordinary commercial grower (except under glass), so we can pass them by as of interest only to the few. Plums and cherries still remain, and as we have already pointed out the early treatment of these is identical with that of apples and pears—the budding, the grafting, the formation and the cultivation are all similar.

There is no doubt that stone fruit suffers even more than apples and pears from the attacks of insect pests, probably because the foliage is more tender or contains more palatable properties, but whatever the reason the fact remains. We have seen black aphis so

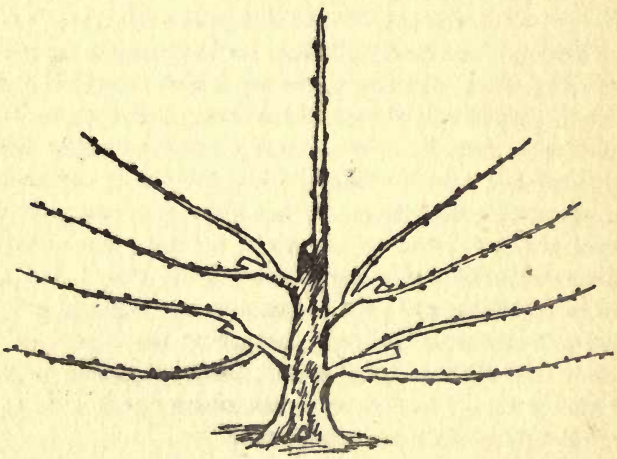

FIG. 27.—Two-year Trained Plum on Mussel Stock

thick on young cherries as to hide foliage and wood, and plums as thickly crowded with the blue. When they attack trees in such vast swarms they sap their vitality to such an extent that in a very brief period they can so cripple them as to weaken them for years. The only thing we can do is to be on the look-out, to spray against them and to spray for them ; if we cannot prevent the attack we can stamp it out by timely effort.

Cherries do remarkably well on well-drained warm soils, especially on fairly open, deep loam over chalk. For a limited number of years they can be profitable on shallow soils, but in course of time die off a branch at a time or even altogether in one

trying season. While it is yet in the vigour of its youth it will stand pruning, and, indeed, it is not the knife which hurts the cherry, but the saw. Therefore it should be so formed when young that the main branches may never become crowded and none have to be sawn off. When it reaches full maturity and conditions are suitable it is the most valuable of fruits. There is a large tree in a cottage garden near by that pays the rent of the cottage, and, needless to say, that cottage never wants a tenant. We, however, advise intending planters not to plant cherries unless the district has been proved to suit them.

Literature

Practical fruit growing is never going to be learnt from the reading of any one or any number of books, but there is a vast amount of "specialized" knowledge only to be gathered from reading the investigations and conclusions of experts, especially where they have been directed to diseases, their origin and character, insect pests and their life history and habits, and to the science of the soil. Such information as they can impart is of inestimable value to the busy, practical man, and the books written by competent authorities are among those which Bacon would tell us "are to be digested."

The man who stores his mind with all the latest and best information brings a light to bear upon his daily path which he finds to be more than helpful. To know the history and habits, for instance, of the Codlin Moth and the Pear Midge is to know the best time for, and the best methods of, dealing with them most effectively; to know the cause of Silver Leaf, of scab and canker, is to be armed against them. Such things remain mysteries to him who does not avail himself of the researches of those trained scientists whose mission in life is to prosecute their researches entirely for our common benefit; and for such a man we can only feel a certain pity. Yet it must be said there are those to-day who have a profound contempt for what they call "theory," and are without sufficient intelligence to discern that though practical knowledge is the right hand, scientific knowledge (insufficiently classed as theory) is the left hand. Surely it is better to have two hands than one!

There is already an extensive and rapidly increasing literature

on subjects which closely concern us as fruit-growers, and it is of the first importance that we should avail ourselves of it. Our lives are too short and we are already too busy to make investigations for ourselves, except perhaps in one or two directions, and it is really nothing but a wise allocation of duties for some to investigate and discover and others to apply the results. How utterly futile and even contemptible it would be, say, for example, if we professed to deal with the whole subject of fruit growing in a small book like this ! The greatest genius cannot compress a library into one small volume, and that is why we most earnestly recommend every grower to acquaint himself with the works of authorities on special subjects rather than to rely upon works of a more general character. " A little knowledge is a dangerous thing." A half-informed man may be more dangerous than a wholly ignorant one. He who does not read, does not *know ;* and it would be very unwise for any one, no matter how enthusiastic, to embark upon such a highly technical and scientific undertaking as the growing of fruit without preparing himself and fortifying himself with all the best and expert knowledge available.

Literature, whether in book or pamphlet form, or in that of a weekly journal, such as *The Fruitgrower*, is as necessary as the staff of life ; and even " he who runs " must read.

CHAPTER XII

MARKETING FRUIT

To produce high-grade fruit and forego half its value just for the want of extra effort in the last lap can only be characterized as what it really is—foolishness. That is a downright good old English word which we do not think too strong here.

The strict grading and careful packing of all our best fruit has become a necessary art, more and more acknowledged and acted upon by up-to-date growers. It was not always so. It does not seem long—indeed, it is not long ago—that apples, pears, and plums were marketed as gathered, with no greater care than turnips and potatoes, and a grower who really took pains to grade and pack aright was generally derided by his fellows, because (and it is true) he used to get no better prices than they.

English growers have been slow to learn, and nothing but the spur of necessity, driven in by keen foreign competition, could arouse us as we have been aroused. We saw that overseas growers, thousands of miles from our markets, could make our produce almost a negligible quantity, not because of any super-excellence in their fruit, but simply by the adoption of enlightened and dependable methods of marketing.

True there were a few voices (all honour to them) raised as far back as the 'eighties, but they were as those crying in the wilderness, and though they were stimulated and powerfully assisted by the uncompromising advocacy of *The Fruitgrower* very early in the 'nineties and ever since, it can be said that only recently has the lesson been really learnt. Truly, our insular prejudice was as thick as the hide of a rhinoceros, but to-day, though we have not adopted the compulsory standards of our competitors, we are advancing by leaps and bounds.

The commercial fruit exhibitions held every autumn are proving a great educational force, and provide object-lessons that none but the most hopelessly dense can ignore, and we are justified in looking forward to the time when British-grown fruit, without a rival in any other clime, will outvie all its competitors as much in its

intelligent and reliable marketing as it does in freshness, flavour, and quality.

Quite obviously we cannot enter into a full discussion of this large and interesting subject here, but we feel we cannot ignore it, and, also, we have to redeem a promise we made when treating of tomatoes in Vol. II. If we can do nothing more than arouse interest where it has not yet been awakened, and directly lead to a closer study of the matter, the little space we can here devote to it will be more than justified.

It will be most in keeping with the morale of this work if we restrict our remarks to the methods of marketing the highest grades of hardy fruit, rather than the grading and packing, in bulk, in larger parcels. The barrel, the sieve, and the bushel box are very suitable when ordinary graded crops are being packed, but are much too large for the selected fruit we have in mind, for we are of the opinion that the choicest selections of dessert, and even cooking, fruit ought not to be sold by measure, but by count—by the dozen. If it pays the exporter of Tangerine oranges to wrap each orange in silver paper, pack a dozen in a dainty box lined with laced paper and send it several hundreds of miles, surely it would pay us to as daintily pack choice dessert apples, pears, and gage plums ! Can we suppose that the Tangerines would realize as much if they were not so packed ? that the cost of packing was not more than covered by the enhanced price ? The packers would smile if we suggested the contrary. We argue, then, that if deft fingers and refined taste, carefully trained and applied, are able to increase the net value of our fruit to an appreciable extent and increase our sales at the expense of our foreign competitors, then it is surely up to us to, at least, give it a trial. The silver paper may stand aside as yet ; but the dainty package, the wrapping of each fruit in tissue, wholly or in part, and the artistic finish to the whole, is calculated to appeal to buyers and would surely profit us.

It has always appeared to us that the estimate we ourselves place on the value of any produce finds its expression in the care we take in packing it, and we have lived long enough to know that there is more than a modicum of truth in the old adage, " The world takes us at our own valuation." If by taking extra pains in the packing of our fruit we prove to all and sundry that, in our estima-

tion, it is well worth it, they will probably think the same, just as readily as they would assume that other fruit roughly packed was, in the estimation of the sender, not worth taking pains with. How often we have seen that the difference in packing has been the measure of the difference in price!

This has been proved to demonstration again and again and in nothing more than tomatoes, in the packing of which there has been a complete revolution. Those of us who can call to mind the methods prevailing during the earlier years of this century will remember how crude they were. The fruit, as gathered and with

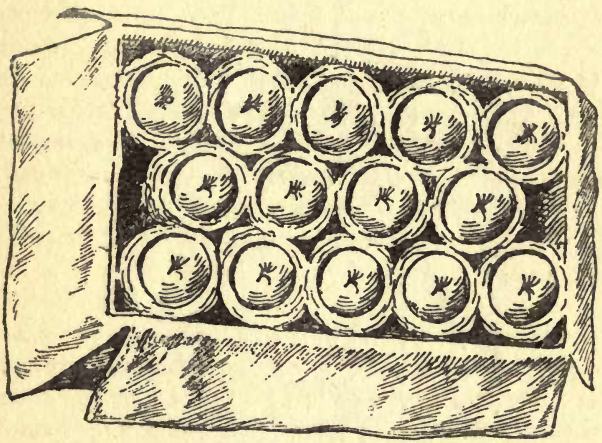

FIG. 28.—Box of Cox's Orange. Fruit wrapped in paper

no pretence at grading, was put into a basket just as it came, though a few of the best were reserved for the top. When the basket was full it was weighed and the net weight duly entered on the address label. The question of grading and uniform weights had come to the fore and was urged strongly upon growers who, in the main, were not keen to make any alteration. We ourselves were at the head of a very serious attempt to bring about an improvement, the necessity for which was forced upon us, and which seemed to us to promise the best results. We sought to establish a federation of local growers who would be willing to have their fruit packed at a central shed, so as to be uniform in grade and in weight of package.

Probably we were ahead of the time in wishing to pack at a central station, though we have been always convinced that the scheme was thoroughly sound; but our effort did not last beyond the initial stages, and not long enough to prove its advantages. But it did not fail. The ideas it stood for took root, and to-day the vast majority of tomato growers send their produce to market uniformly graded and of uniform weight, viz. 12 lb. There does not exist to-day, nor will there ever again exist, any desire to revert to the old-time lack of system.

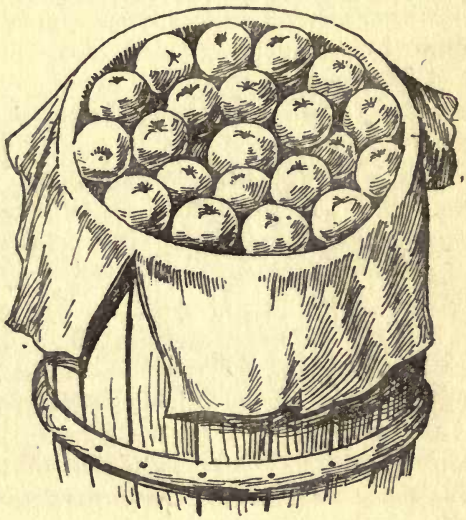

FIG. 29.—Barrel of Bramley's

This same revolution is being rapidly effected with our hardy fruits, and we are anxious to hasten it. Tremendous advances have been made and are yet in the making. How great they are we can best illustrate by one further reminiscence. Come with us back to 1894. We are on the premises of what, for that time, was a large fruit grower. The barn in which we were standing was a very large one, and the floor was covered with large pyramids of fruit covered with straw. The pyramids varied in size, some containing about 5 cwt., others as many as 3 or 4 tons. It was January. The fruit had been gathered into bushel baskets and shot into these

heaps just as though it was a potato crop. Now the straw is pushed back and revealed sweaty, dirty fruit with plenty of rotten ones communicating the rot to their neighbours. Women with cloths wiped each fruit and dropped it into a sieve, and when the sieve was full a sheet of newspaper and hay were placed on top and held down by crossed sticks. Nearly every fruit showed marks of bruises, was more or less braised by the rubbing, and large and small were indiscriminately packed together. That was the good old-fashioned way in the good old-fashioned times—a way which simply issued invitations to more alert and methodical foreign growers and packers to come over and establish themselves on our markets without the slightest fear that we should ever compete with them.

These are outspoken remarks dealing with the matter generally rather than specifically, intended to supplement the efforts of those earnest men who in season and out of season are urging this matter upon our growers, who are working not only for present gain, but for the building up of our home-grown hardy fruit trade on impregnable lines.

Select Market Varieties

While for reasons stated we deliberately abstained from recommending any particular varieties of apples, pears, and plums as the best for particular purposes, it has been suggested to us that a list of the more popular varieties might be helpful. This we have no hesitation in giving, but we adhere to our previous remarks and would insist upon the need for local enquiries and investigations as the safest course to pursue, not so much as to ascertain what to grow, but to know what NOT to grow.

12 Dessert Apples

Allington Pippin.
Beauty of Bath.
Blenheim Orange.
Cox's Orange.
Charles Ross.
Devonshire Quarrenden.
Duchess' Favourite.
Gladstone.
James Grieve.
King of the Pippins.
Ribstone Pippin.
Worcester Pearmain.

12 Culinary Apples

Annie Elizabeth.
Bismarck.
Bramley's Seedling.
Early Victoria.
Grenadier.
Grosvenor.
Lane's Prince Albert.
Lord Derby.
Newton Wonder.
Pott's Seedling.
Stirling Castle.
Warner's King.

12 Dessert Pears

Beurre d'Amanlis.
Beurre Capiamont.
Beurre Superfin.
Conference.
Dr. Jules Guyot.
Doyenne du Comice.
Hessle.
Jargonelle.
Louise Bonne.
Pitmaston's Duchesse.
Marie Louise d'Uccle.
Williams' Bon-Chrétien.

6 Culinary Pears

Beurre Clairgeau.
Catillac.
Fertility.
Uvedale's St. Germain.
Vicar of Winkfield.
Winter Windsor.

12 Plums

Belle de Louvain.
Bush.
Czar.
Early Rivers.
Emperor.
Kirk's.
Monarch.
Orleans.
Pond's Seedling.
Prince of Wales.
Pershore Egg.
Victoria.

Perhaps the omissions from the above list are almost as apparent to the reader as those given for Lady Sudeley, Wellington, Rival, Ecklinville, Royal Jubilee, and other apples; Durondeau, Brown Beurre, Gansel's Bergamot pears; Prince Englebert, Golden Drop, Magnum Bonum plums, would all claim a place in a more inclusive list. But we fear there are already too many varieties marketed,

and the fact that so many are of almost equal merit only confuses the issues. Certain districts may have to grow some outside variety suitable to it, which may be as saleable as any of the above, though it could not attain to any position in a general selection. It would be quite wrong of any district to throw away an advantage by discarding a fruit that suited the peculiarities of their soil and situation in favour of one which would bring them up against a keener competition. We have, here and there, come across magnificent seedlings not known by name, but known to fame and most ready sellers, perhaps too much like some already established favourite with which a salesman would almost certainly classify it.

In the selection we only repeat ourselves when we point out that it must be made with some reference to season, due proportions of early, semi-early, main crop, and late varieties all finding a place. Possibly this may not mean that a succession will make the best returns, but it is more than convenient in keeping the machinery in good working order.

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